PB89-182414

Superfund Record of Decision (EPA Region 7)
Times Beach, St. Louis County, Missouri
Minker/Stout/Romaine Creek, Jefferson County
Missouri (Third Remedial Action), September 1988

(U.S.) Environmental Protection Agency
Washington, DC

29 Sep 88

U.S. Department of Commerce
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EPA/ROD/R07-88/016
September 1988

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EPA

Superfund Record of Decision:

Miner/Stout/Romaine Creek, MO

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16. Abstract (Limit: 200 words)

The Minker/Stout/Romaine Creek (M/S/RC) site is located in the city of Imperial, Jefferson County, Missouri, 25 miles southwest of St. Louis. The site is an unincorporated, wooded residential area and is comprised of four noncontiguous areas: Minker, Stout, Cashel, and Sullins. It is within a distance of approximately 0.8 miles and includes the upper 6000 feet of Romaine Creek. Contamination at the site resulted from the use of dioxin-contaminated soil as fill material, and has spread as a result of e[illegible]ion from these areas. Contaminated soil in all areas except the Stout area and R[illegible]aine Creek has been excavated and currently is stored in interim onsite storage. The total volume of contaminated soil at this site including the amount in temporary storage is estimated to be 12,000 cubic yards. The primary contaminant of concern affecting the soil at this site is 2,3,7,8-TCDD (dioxin).

The selected remedial action for this site includes: excavation of soil exceeding 20 ppb dioxin and offsite thermal treatment and incinerator ash disposal at the Times Beach site; placing of clean soil cover and revegetation over all areas with residual dioxin levels between 1 and 20 ppb; and offsite thermal treatment and incinerator ash disposal at the Times Beach site of contaminated soil held in interim storage. The estimated total capital cost for this remedial action is $48,800,000, which includes all costs from the Times Beach site.

17. Document Analysis a. Descriptors
Record of Decision
Minker/Stout/Romaine Creek, MO
Third Remedial Action
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Key Contaminants: dioxin

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RECORD OF DECISION DECLARATION

SITE NAME AND LOCATION

- Times Beach, St. Louis County, Missouri
- Minker/Stout/Romaine Creek, Jefferson County, Missouri

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Times Beach site in St. Louis County, Missouri, and the Minker/Stout/Romaine Creek site in Jefferson County, Missouri, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for this site. The attached index identifies the items that comprise the administrative record upon which the selection of the remedial action is based.

DESCRIPTION OF THE SELECTED REMEDY

This remedial action represents the final action for dioxin-contaminated soils at the Times Beach and Minker/Stout/Romaine Creek site and final disposition of structures and debris at Times Beach. This remedial action addresses the principal threats at the sites by thermal treatment of soils that exceed a level of concern for the protection of human health and the environment for designated non-residential land uses. Thermal treatment results in the destruction of dioxin in the treated soils, permanently removing this contamination from the environment. The selected remedy also includes placement of a vegetated soil cover over areas with contaminant levels exceeding health-based levels for residential areas, which provides an additional barrier for protection of human health and the environment.

Excavation of contaminated soils at Times Beach is included in this remedial action. Excavation of contaminated soils from the various portions of the Minker/Stout/Romaine Creek site has been completed or is planned through separate operable units.

The major components of the selected remedial action include:

- Demolition and onsite land disposal of uncontaminated structures and debris at Times Beach in a facility meeting solid waste disposal requirements.
- Construction of a ring levee to protect a temporary thermal treatment unit from a 100-year flood.

- Mobilization of a temporary transportable thermal treatment unit to Times Beach.

- Excavation of all dioxin-contaminated soils at Times Beach exceeding a level of concern for protection of human health and the environment for designated non-residential land uses.

- Thermal treatment of soils excavated from Times Beach and the Minker/Stout/Romaine Creek site.

- Delisting and onsite land disposal of treatment residue (ash) in a facility meeting solid waste management requirements.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to this remedial action and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining onsite above health-based levels for unrestricted use, a review will be conducted within five years after the commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

September 29, 1988
Date

J. Winston Porter, Ph.D.
Assistant Administrator
Office of Solid Waste and
Emergency Response

RECORD OF DECISION

FOR

FINAL MANAGEMENT OF

DIOXIN-CONTAMINATED SOIL AND
FINAL DISPOSITION OF STRUCTURES AND DEBRIS AT

TIMES BEACH, MISSOURI

and the

MINKER/STOUT/ROMAINE CREEK SITE, MISSOURI

Prepared by

U.S. ENVIRONMENTAL PROTECTION AGENCY

September 28, 1988

i.d

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I. SITE NAME, LOCATION, AND DESCRIPTION

This Record of Decision presents the final remedy for dioxin-contaminated soils at two Superfund sites: the Times Beach site in Times Beach, Missouri, and the Minker/Stout/Romaine Creek site (M/S/RC) in Imperial, Missouri.

Times Beach was formerly an incorporated city in southwest St. Louis County, approximately 20 miles southwest of the City of St. Louis. The site encompasses approximately 0.8 square miles, bordered on the north and east by unincorporated areas of St. Louis County, on the south by unincorporated areas of Jefferson County, and on the west by the City of Eureka. The City of Times Beach was disincorporated in 1985.

On the north and east, the site is contiguous to the Meramec River, the dominant hydrological feature in the area. The site is bisected at the southern end by Interstate 44. Burlington Northern Railroad lines are adjacent to Times Beach to the west. Much of the site is located in the five-year flood plain, and the entire site is within the 25-year floodplain. The area's topography is level to slightly sloping, with an average slope of less than one percent. Residential development has historically constituted the major land use. Commercial land use has been minimal, and the city has had no industrial development. The surrounding areas have a mixture of residential and agricultural uses. Agricultural usage consists of cropland; no areas in close proximity to Times Beach are used for grazing.

The Minker/Stout/Romaine Creek site (M/S/RC) is in an unincorporated, residential area approximately 25 miles southwest of St. Louis. The area is generally wooded, with steep hillsides and thin soil. This site includes four non-contiguous areas (Minker, Stout, Cashel, and Sullins) within a distance of approximately 0.8 miles, and the upper 6,000 feet of Romaine Creek, which originates at the Minker area.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Over 1,000 soil samples collected from Times Beach, and a similar number from the M/S/RC site, have been analyzed to determine the extent of dioxin contamination.

The contamination at M/S/RC resulted from the use of dioxin-contaminated soil as fill material. Contaminated soils have been excavated from all portions of the site except the Stout area and Romaine Creek and placed in interim onsite storage. The investigations indicate that the remaining contamination is confined to the fill placed at the Stout area, and portions of Romaine Creek to which the contaminated soil has migrated, primarily through erosion from the Minker area. Interim remedies are underway to excavate this remaining contaminated soil for temporary onsite storage.

The contamination at Times Beach resulted from spraying roads for dust control in the 1970s with oil that was contaminated with dioxin. Initial soil samples were collected by EPA in 1982. In February 1983, on the basis of an advisory from the Centers for Disease Control (CDC), EPA transferred $33 million, under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), to the Federal Emergency Management Agency (FEMA) to permanently relocate Times Beach residents and businesses.

Additional information about the sites, the history of their contamination, and the investigations that EPA has conducted is presented in the feasibility studies and other documents in the Administrative Record.

The potentially responsible parties (PRPs) for these sites include the generators of the dioxin waste, the transporter and sprayer of the waste, and those who arranged for the transport and spraying of the waste.

In November 1984, an administrative order was issued to The Charter Company, Charter International Oil Company, Charter Oil Company and Independent Petrochemical Corporation pursuant to Section 106 of CERCLA for the Times Beach site and for the Minker/Stout/Romaine Creek site. Each order required the named respondents to implement a remedial investigation and feasibility study and, after approval by EPA, to implement remedial design and remedial action for each site. These corporations had filed for reorganization pursuant to Chapter 11 of the Bankruptcy Code April 19, 1984.

In addition to the above orders, EPA also filed a proof of claim in the bankruptcy proceeding relating to costs incurred at the Times Beach and the Minker/Stout/Romaine Creek site. In January 1987, EPA entered into a consent decree with The Charter Company, Charter International Oil Company and Charter Oil Company in settlement of all claims of the United States against those companies relating to the presence of dioxin at the Times Beach site, the Minker/Stout/Romaine Creek site and other sites. Subsequent to the entry of this consent decree, The Charter Company, Charter International Oil Company and Charter Oil Company were dismissed as respondents in the administrative orders.

Special Notice letters were issued to three Syntex entities and to Independent Petrochemical Corporation March 31, 1988. The moratorium required by Section 122(e) of the Superfund Amendments and Reauthorization Act (SARA) began on the date of issuance of this notice.

III. COMMUNITY RELATIONS HISTORY

Public participation in the selection of a final remedial action for the M/S/RC site began with the public release of the Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site in July 1986. This study evaluated remedial alternatives for the dioxin-contaminated soil being temporarily stored at the site, located approximately ten miles south of Times Beach. Remedial alternatives evaluated in this study are similar to those evaluated in the Times Beach Feasibility Study, with the addition of disposal in underground mines and thermal treatment at a permitted commercial facility. One option evaluated consisted of offsite thermal treatment at a nearby centralized facility within 50 miles of the Minker/Stout/Romaine Creek site.

A public comment period was held from August 8, 1986, through September 5, 1986, for the Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site. A public meeting was held August 25, 1986, to discuss the alternatives evaluated in the study and the Agency's proposed remedy.

The public was first invited to comment on the concept of a comprehensive solution for all of the eastern Missouri dioxin sites at the public meeting for the M/S/RC feasibility study. At that meeting, it was announced that the State of Missouri had recommended evaluation of Times Beach as a location for siting a temporary thermal treatment unit and that EPA was evaluating this possibility. A feasibility study to evaluate Times Beach as a potential location for thermal treatment was to be completed and released for public comment.

The Times Beach Feasibility Study was released for public comment from December 29, 1986, through March 27, 1987. A public meeting was held on February 12, 1987, to discuss alternatives evaluated in the study and to present the Agency's proposed remedy. During the meeting, the public was told that EPA may determine that dioxin cleanup levels higher than 1 ppb could be acceptable for non-residential settings, as discussed in the Times Beach Feasibility Study, if they were acceptable to State and Federal health authorities.

The Times Beach and M/S/RC Proposed Plan was released February 19, 1988. A public comment period was held from February 19 through March 18, 1988, and a public meeting was held in Eureka, Missouri March 10. The proposed plan recommended centralized thermal treatment of contaminated soils at Times Beach and the M/S/RC site at a temporary thermal treatment facility to be located at Times Beach. The Proposed Plan specified an action level for Times Beach of 20 ppb, and included a one-foot soil cover in areas exceeding 1 ppb.

All decision documents and responsiveness summaries are included in the Administrative Record and can be referred to for additional information on public participation and response to previous activities.

IV. SCOPE AND ROLE OF RESPONSE ACTION

EPA is seeking a cost-effective overall remedy for the dioxin-contaminated sites in eastern Missouri (See Table 1). The decisions made now for Times Beach and M/S/RC can affect the range of alternatives that will be available for the other eastern Missouri dioxin sites listed in Table 1. Alternatives for later actions, if such action is determined by EPA to be necessary at the other sites, may involve thermal treatment at Times Beach. The decision made now for Times Beach will have a direct impact on the availability of treatment or management capacity at Times Beach for these other sites.

In order to ensure that the remedy selected for Times Beach and M/S/RC is consistent with an overall cost-effective remedy, EPA must consider the potential need for remedies at all of these sites in its evaluation of alternatives for Times Beach and M/S/RC. In the cost-effectiveness analysis especially, EPA must not evaluate alternatives for these two sites in isolation, but must evaluate costs in the context of an overall solution. Selection of the least costly alternative for Times Beach and M/S/RC now may result in higher overall costs later.

For the purpose of evaluating alternatives for Times Beach and M/S/RC, EPA has had to make some assumptions about the remedy that will most likely be selected for at least some of the other sites. On the basis of the best available information and more than five years of experience with the dioxin problem, EPA has concluded that offsite treatment or disposal is the remedy most likely to be selected for the other sites, if action is determined to be necessary by EPA. These alternatives were included in the analysis presented in the Proposed Plan.

The remedy selected in this Record of Decision assumes that either offsite thermal treatment or disposal will be selected and implemented for the other sites, and the cost-effectiveness analysis evaluates the alternatives for Times Beach and M/S/RC in that context.

The selected remedy also includes final disposal for the existing structures at Times Beach. Alternatives evaluated for this material were developed and evaluated in the Times Beach Feasibility Study. The feasibility study estimated that 105,000 cubic yards of structures and debris exist at Times Beach.

It is the intent of EPA to prioritize the disposal of the structures and debris at Times Beach. Demolition and disposal of the structures and debris could begin as soon as the disposal facility is designed and constructed. Structures and debris would initially be removed from the uncontaminated portions of Times Beach, which include areas most visible from Interstate 44.

The only dioxin sites being considered for potential thermal

TABLE 1

POTENTIAL MISSOURI DIOXIN SITES FOR CENTRALIZED TREATMENT/DISPOSAL AT TIMES BEACH

SITE NAME	ESTIMATED SOIL VOLUME, CY
1. Minker/Stout/Romaine Creek	
Stout Area	1,900
Romaine Creek	4,300
Minker, Minker Neighbors	4,400
Cashel Residence	400
Sullins Residence	1,000
2. Lacy Manor	600
3. Ellisville Area Site	7,000
4. Community Christian Church	550
5. Manchester Methodist Church	300
6. Eureka-East North Street	750
7. Baxter Garden Center	1,500
8. Highway 141 Access Road	620
9. East Texas Motor Freight	1000
10. Bull Moose Tube	300
11. Hamill Transfer	1,800
12. Jones Truck Lines	1,000
13. Overnite Transport*	---
14. Southern Cross Lumber	1,300
15. Times Beach	13,600
16. Arkansas Best Freight*	---
17. Bonifield Brothers Trucking	2,100
18. Timberline Stables	1,600
19. Bubbling Springs Arena	2,780
20. Saddle and Spur Arena	2,550
21. Shenandoah Stables	3,300
22. Piazza Road	7,800
23. Frontenac Tank Site	750
24. Castlewood	12,900
25. Quail Run	16,000
26. Bristol Steel	---
TOTAL	92,100

* Dioxin levels detected to date below level of concern for occupational exposure. Levels to be verified.

treatment at Times Beach are listed in Table 1. These are the sites which became contaminated as a result of application of waste oil by the Bliss Waste Oil Company in the early 1970s. The waste oil contained dioxin wastes from a chemical plant in southwest Missouri. All of these sites are in eastern Missouri. The Agency will limit the potential sources of material to be thermally treated at Times Beach to these twenty-six (26) sites. Inclusion in the list does not imply that the Agency has decided to take action at the sites. Each site other than Times Beach and Minker/Stout/Romaine Creek will be evaluated individually, and the decision made based upon the threat to public health and the environment presented at the site. The Agency estimates that thermal treatment of the material from the twenty-six (26) sites identified in Table 1 could be completed within six (6) years after receipt of the RCRA permit. This project period is based upon a thermal treatment rate of approximately 100 cubic yards of soil per day. The assumptions associated with this treatment are discussed in Section IX (page 29 below). Upon completion of treatment of materials from the designated twenty-six sites, the thermal treatment unit would be disassembled and permanently removed from Times Beach.

A RCRA Part B permit will be required for thermal treatment of materials transported to Times Beach. The RCRA permit is issued by the State of Missouri. Public participation is an important consideration in the permitting process. RCRA permits may be issued for periods not to exceed ten (10) years according to Federal regulations (40 CFR 270.50). The Agency will request a permit for the thermal treatment unit for six (6) years.

V. SITE CHARACTERISTICS

The investigations at Times Beach indicate that the contamination is limited to the roads, road shoulders, and drainage ditches along the roads, and that the contamination is generally limited to the top twelve inches of the soil. Concentrations of dioxin greater than 20 parts per billion (ppb) have been detected on approximately 15,000 feet of roadways, and dioxin levels exceeding 100 ppb have been detected on approximately 7,000 feet of roadways.

Soil volume estimates based on the most recent sampling at Times Beach indicate that approximately 13,600 cubic yards of soil is contaminated at levels above 20 ppb. The sampling used to develop this estimate was carried out according to a statistically-based method that allows calculation of the maximum average expected dioxin level within a sampling area to the 95th percentile upper confidence limit.

Samples analyzed for dioxin have indicated that the air, ground water, surface water, river sediments, and finished drinking water taken from the river downstream of Times Beach are not contaminated with dioxin.

Contaminated soils from the Minker, Cashel, and Sullins areas of M/S/RC have been removed and placed in temporary storage facilities on site. Actions are being taken to excavate the remaining contaminated soil at the Stout and Romaine Creek areas for placement in temporary storage.

A number of potential pathways exist for dioxin to come into contact with human receptors or sensitive environmental areas. Human exposure to dioxin can occur as a result of ingestion, inhalation, or direct contact. Ingestion of dioxin could result from the consumption of contaminated water, soil, fish, or other plant or animal material. Ingestion of dioxin-contaminated water is not thought to be a problem at either M/S/RC or Times Beach because no ground water or surface water samples have shown detectable levels of dioxin except during storm events, and dioxin has a very low solubility in water. Also, dioxin is highly adsorptive to soil particles, and migration into the ground water is considered unlikely. Sediment transport with stormwater runoff, particularly during flood events, represents the primary mechanism by which dioxin could enter the Meramec River.

Almost 150,000 square yards (30 acres) of roadway and shoulder surface area are estimated to be contaminated at levels greater than 1 ppb at Times Beach. There does exist a limited potential for surface contamination to reach the river by transport during rainfall events, particularly during periods of flooding at Times Beach. The potential for suspended contaminated sediment to reach the Meramec during normal Meramec River flow conditions is much lower since most of the site is depositional in nature and the high river banks generally retain the stormwater within Times Beach. Stormwater is retained on the site until it is absorbed into the ground. In addition, the majority of the dioxin contamination is located beneath roadway pavement, which prevents its erosion. The high river banks also control the quantity of dioxin-contaminated suspended sediment that could be transported to the Meramec River as floodwaters recede. Significant contaminant levels have not been detected in yards and other off-road areas following flooding.

VI. SUMMARY OF SITE RISKS

Contaminants of Concern

The contaminant of concern at both sites is 2,3,7,8-TCDD, commonly referred to as dioxin. Dioxin is considered one of the most toxic compounds known, with the lowest LD-50 (lethal dosage for 50% of the subjects exposed) level for male guinea pigs, the most sensitive species, being only 0.6 micrograms per kilogram (ug/kg).

Although dioxin has been highly toxic in all species tested, there are large species differences in sensitivity, with the LD-50 for hamsters being 1,157 to 5,051 ug/kg. The characteristic signs and symptoms of lethal dioxin poisoning in laboratory animals are severe weight loss and thymic atrophy. Death usually occurs many days after exposure. After subchronic or chronic exposure to dioxin in rats or mice, the liver appears to be the most severely affected organ, although systemic hemorrhage, edema (excess fluid accumulation), and suppressed thymic (immune system) activity are also observed.

Animal studies have also demonstrated that dioxin is teratogenic (causes malformities) and fetotoxic (toxic to fetus) in mice, rats, rabbits, and ferrets and is fetotoxic in monkeys. Because dioxin produced a statistically significant increased incidence of tumors in two animal species, there is sufficient evidence to conclude that dioxin is an animal carcinogen. In fact, dioxin is the most potent animal carcinogen evaluated to date by the EPA Carcinogen Assessment Group. For comparison, dioxin is about 50 times as potent as the third most potent animal carcinogen evaluated (bis-chloromethyl ether) and about 50 million times more potent than vinyl chloride (a widely known carcinogenic substance).

Study results concerning humans that have been exposed to herbicides and other chlorinated chemicals containing dioxin as a contaminant indicate that excessive exposure leads to altered liver function, lipid metabolism, and neurotoxicity. In addition, humans may develop the skin lesions chloracne and hyperpigmentation.

The available epidemiologic evidence concerning the carcinogenicity of dioxin in humans is inadequate. Considering the available animal carcinogenic and epidemiologic data, however, the overall weight-of-evidence classification for dioxin (using EPA's interim classification scheme) is category B2, a probable human carcinogen.

Polychlorinated dibenzo-p-dioxins are a class of chlorinated tricyclic aromatic hydrocarbons consisting of two benzene rings connected by a pair of oxygen atoms. According to the position and number of chlorine atoms, it is possible to form 75 different types of chlorinated dioxins. The word "dioxins" is often used to refer to this class of compounds, especially with respect to the highly toxic 2,3,7,8-tetrachlorodibenzo-p-dioxin that is present at Times Beach. This class of compounds is stable toward heat, acids, and alkalis. They are also chemically stable and start to decompose only at temperatures greater than 500 degrees C. The percent of decomposition depends upon the residence time at high temperature and the proportion of oxygen in the heated zone.

Physico-chemical properties suggest that dioxin will adsorb tightly to organic material in soil, resulting in low mobility. Once in the soil, degradation processes tend to be very slow, with half lives estimated to be ten years or longer.

Calculated and experimental results show that dioxin will concentrate in biota present in aquatic media. Reported bioconcentration factors of dioxin in fish range from about 2,000 to 30,000. In mammals, dioxin is readily absorbed through the gastrointestinal tract. Absorption through intact skin has also been reported. Absorption may decrease dramatically if dioxin is adsorbed to particulate matter such as activated carbon or soil. After absorption, dioxin is distributed to tissues high in lipid (fat) content; however, in many species the liver is a major storage location. Metabolism of dioxin occurs slowly, with metabolized TCDD excreted in the urine and feces. Unmetabolized dioxin can be eliminated in the feces and in the milk.

Risks to Human Health and the Environment

Continued long-term direct contact with or ingestion of soils would present the greatest threat to human health. This exposure potential for humans has been limited in the short term at Times Beach by controlling site access. Ingestion of dioxin by wildlife could occur in the event that dioxin entered the Meramec River and was ingested by fish or by direct ingestion of Times Beach soils. Wildlife onsite are susceptible to becoming contaminated as there are no controls to prevent animals from entering the site.

Inhalation of dioxin-contaminated airborne particulates presents a potential route of human exposure primarily for workers during periods of onsite construction activities involving disturbance of contaminated soils. Mitigative measures exist to control this risk.

Ingestion of plants grown in contaminated soil represents a potential exposure route, although there is uncertainty regarding the potential for uptake of dioxin in plant life. Dioxin uptake in many plants appears to be minimal. This potential pathway is currently controlled by restricting site access. Land use restrictions represent another effective means of controlling this exposure potential, although potential uptake in plants would be unaffected.

The most serious environmental problem which could be expected at Times Beach is the transport of dioxin to the Meramec River due to erosion of surficial soils. The current threat to human health and the environment due to bioaccumulation in fish as a result of the release of dioxin from Times Beach into the Meramec River appears to be insignificant. Although fish in the Meramec River have shown detectable levels of dioxin, contaminant levels have been below the advisory level of 50 parts per trillion (ppt) designated by the Food and Drug Administration for unrestricted consumption of fish from the Great Lakes. The data collected to date indicate that dioxin contamination in the Meramec River is primarily a result of other sources downstream of Times Beach.

Risk Assessment

A paper was published in 1984 by Renate D. Kimbrough, M.D., et al., of the Center for Environmental Health, Centers for Disease Control, which evaluated acceptable soil concentrations of dioxin in residential settings. A risk assessment was performed in this paper on the basis of several chronic feeding studies in rodents. The smallest lower confidence bound for the average lifetime daily dosage corresponding to a 1 x 10-6 incremental cancer risk was calculated to be 28 femtograms per kilogram body weight per day (fg/kg b.w./day). This calculation was based on data for hepatocellular carcinoma (liver cancer) and neoplastic nodules. This means that a lifetime average dosage of 28 fg/kg b.w./day would be expected to result in one additional case of this particular type of cancer for each million individuals so exposed. This level is based upon a number of conservative assumptions, as discussed in the 1984 paper. Cancer in other types of body tissues would occur at higher dosages. On the basis of data for tissues less sensitive than the liver, the paper reported that an incremental cancer risk of 1 x 10-6 would be expected to occur at a lifetime dosage level of 1,428 fg/kg b.w./day. Due to the number of conservative assumptions upon which the daily dosage was estimated, and the substantial range in dosages calculated to result in incremental incidences of cancer, the paper concluded that residential soil levels greater than 1 ppb dioxin pose a level of concern for public health. The paper also concluded that dioxin levels other than 1 ppb may be acceptable in certain non-residential settings.

Intake levels for residential exposure were calculated in the 1984 study by Kimbrough, et al., for dermal (skin), ingestion and inhalation exposure pathways. In residential settings, the principal exposure pathway is through ingestion of contaminated soil. Ingestion of soil by children is of particular concern in residential areas. Small children may consume soil directly during play. Inadvertent ingestion of soil by both children and adults can also occur. The study estimated the average lifetime daily dosage resulting from exposure to 1 ppb dioxin in a residential setting, occurring primarily through ingestion, to be 636.5 fg/kg b.w./day. This recommendation formed the basis for the criteria of 1 ppb dioxin which has been applied during the cleanup of all residential sites in Missouri to date.

Subsequent to the 1984 health assessment, the Center for Environmental Health, Centers for Disease Control, has continued to evaluate acceptable dioxin levels in residential and non-residential settings. In May 8, 1987 correspondence, the Center for Environmental Health recommended that residential sites contaminated with dioxin be cleaned up to a residual concentration of 1 ppb at the surface or to a residual concentration of 5 to 10 ppb at a depth of one foot or greater and backfilled to original grade with clean soil. The upper foot of clean material serves as a barrier restricting human access from contact with the contaminated soil. In the event that the contaminated soil is disturbed, the resulting surface concentration would remain below a level of concern for residential settings. This recommendation is based upon assumptions made in the 1984 study by Kimbrough, et al.

Dioxin cleanup levels have been established for different media during cleanup of other Missouri dioxin sites. A cleanup level of 4 picograms per square meter (pg/m2) has been recommended for interior surfaces by CDC. The action level for dioxin in water is limited by the detection limit, which by current methods is approximately 1 ppt. A level of 3.0 picograms per cubic meter (pg/m3) representing the average of 14 data points collected at 24-hour intervals has been used as a level of concern for airborne dioxin levels during the cleanup of other eastern Missouri dioxin sites.

The 1984 Kimbrough study recommended that risk management decisions by EPA should be based upon a consideration of the specific circumstances and exposure opportunity at each contaminated site. The paper noted that in certain non-residential areas, higher levels may present an acceptable degree of protection of human health. Conversely, soil levels less than 1 ppb dioxin may be of concern in areas used for certain agricultural purposes.

Potential exposure in non-residential areas, in addition to being less frequent and of shorter duration, occurs through different primary pathways than in residential settings. While ingestion is the principal exposure pathway of concern in residential settings due to the potential for regular contact by small children who may consume substantial quantities of soil, in certain non-residential areas there is less opportunity for this type of regular exposure by small children to occur. In commercial or industrial settings where occupational exposure occurs, direct contact is the primary pathway of concern. The acceptable dioxin soil level is controlled in these non-residential settings by limiting the potential for such contact to occur.

The Centers for Disease Control (CDC) has directed correspondence to EPA containing supplemental information to the 1984 paper by Kimbrough et al. (Attachment 1). The CDC advisory concludes that the average lifetime daily dosage in a commercial setting with 20 ppb dioxin present on 10 percent of the site is approximately 33 fg/kg b.w./day. This calculated dosage is below the average daily dose estimated to be of concern for public health in the 1984 study by Kimbrough et al. In addition, this dosage is substantially below the estimated dosage corresponding to residential exposure to 1 ppb dioxin (636.5 fg/kg b.w./day). EPA has therefore concluded that certain types of non-residential exposure to soil contaminated at 20 ppb dioxin is below a level of concern for public health. The EPA, in consultation with CDC, has concluded that a remedial action at Times Beach resulting in removal of soils exceeding 20 ppb and covering remaining areas exceeding 1 ppb with clean soil will reduce the risk associated with non-residential land usage, such as a park, green space, or commercial area, to an acceptable level.

VII. DOCUMENTATION OF SIGNIFICANT CHANGES

The EPA has selected a remedy consisting of centralized treatment of dioxin-contaminated soil at Times Beach. This selected remedy is identical to the remedy proposed in the Proposed Plan of February 19, 1988.

VIII. DESCRIPTION OF ALTERNATIVES

Alternatives were evaluated to satisfy a permanent remedy at both Times Beach and M/S/RC (especially for the cost-effectiveness criterion) in the context of the most likely overall solution for the potential dioxin sites in eastern Missouri listed in this document. Therefore, all of the alternatives included final remedial actions assumed for the contaminated soil from the other sites. On the basis of available information, EPA believes the most likely alternatives to be chosen for M/S/RC and the other sites is either offsite treatment or disposal. All of the alternatives assume that the remedy chosen for the sites other than Times Beach will be either offsite treatment or disposal. Alternatives 1 through 4 assume offsite thermal treatment, and Alternative 5 assumes offsite land disposal. The alternatives that are evaluated are:

Alternative 1

- "RCRA" (Resource Conservation and Recovery Act) equivalent cap over the contaminated areas exceeding 20 ppb dioxin at Times Beach.
- Offsite thermal treatment of the contaminated soils and debris from the M/S/RC site, at a location other than Times Beach.
- Potential offsite thermal treatment of the contaminated soil and debris from the other sites listed in Table 1, at a site other than Times Beach.
- Demolition and onsite disposal of the structures remaining at Times Beach.
- Placement of a one-foot soil cover over portions of Times Beach with residual dioxin levels between 1 and 20 ppb dioxin.

For the Times Beach soils, Alternative 1 includes installation of a cap over contaminated soils exceeding 20 ppb, meeting recommended RCRA design guidance for hazardous waste land disposal facilities. The cap would be of multilayer design, beginning at the base with a bedding layer of clean soil, followed by geotextile fabric, impermeable synthetic membrane, geotextile fabric, drainage gravel, geotextile fabric, and covered with a vegetated soil layer. In addition, a one-foot vegetated soil layer would be placed over all areas with surface dioxin levels greater than 1 ppb, but less than 20 ppb.

The contaminated soils from M/S/RC would be taken to a thermal treatment unit to be built at a site other than Times Beach. A site for the thermal treatment unit has not been identified, but for cost estimation purposes, it is assumed to be within 50 miles of M/S/RC. This alternative assumes, as do Alternatives 2 and 3, that the contaminated soil from the other potential sites would also be taken to this thermal treatment unit.

This alternative would also include, as do all of the other alternatives, demolition and onsite disposal of the structures which remain at Times Beach. The disposal would be in accordance with RCRA Subtitle D and the Missouri Solid Waste Management Law and regulations. The non-hazardous solid waste from the demolition of the buildings may be baled or incinerated (for volume reduction purposes) prior to disposal in compliance with state requirements.

Alternative 2

- An impermeable (non-RCRA) cap over the contaminated areas exceeding 20 ppb at Times Beach.
- Offsite thermal treatment of the contaminated soils and debris from the M/S/RC site, at a location other than Times Beach.
- Potential offsite thermal treatment of the contaminated soil and debris from the other sites listed in Table 1 at a site other than Times Beach.
- Demolition and onsite disposal of the structures remaining at Times Beach.
- Placement of a one-foot soil cover over portions of Times Beach with residual dioxin levels between 1 and 20 ppb.

Alternative 2 was developed at the request of citizens attending the Times Beach public meeting February 12, 1987. It is identical to Alternative 1, except in the details of the cap that would be placed over the contaminated soils at Times Beach. The cap would consist of just two layers. Contaminated areas within Times Beach would be covered with an impermeable membrane, which would then be covered with a 12-inch layer of clean soil and revegetated.

Alternative 3

- Onsite land disposal of the contaminated soils exceeding 20 ppb at Times Beach.
- Offsite thermal treatment of the contaminated soils and debris from the M/S/RC site, at a location other than Times Beach.
- Potential offsite thermal treatment of the contaminated soil and debris from other sites listed in Table 1 at a site other than Times Beach.
- Demolition and onsite disposal of the structures remaining at Times Beach.
- Placement of a one-foot soil cover over portions of Times Beach with residual dioxin levels between 1 and 20 ppb.

Alternative 3 would be identical to Alternatives 1 and 2, except in the final remedy for the contaminated soils at Times Beach. With Alternative 3, contaminated soils at Times Beach would be excavated and placed in an above-ground concrete hazardous waste disposal facility. It is assumed that the hazardous waste land disposal facility would be located in the northwest section of Times Beach.

Alternative 4

- Onsite thermal treatment of the contaminated soils exceeding 20 ppb at Times Beach.
- Offsite thermal treatment at Times Beach of the contaminated soils and debris from the M/S/RC site at Times Beach.
- Potential offsite thermal treatment at Times Beach of the contaminated soil and debris from other sites listed in Table 1.
- Demolition and onsite disposal of the structures remaining at Times Beach.
- Placement of a one-foot soil cover over portions of Times Beach with residual dioxin levels between 1 and 20 ppb.

Alternative 4 is different from all of the other alternatives, except in the demolition and disposal of the structures remaining at Times Beach and placement of a 1-foot layer of clean soil over areas between 1 and 20 ppb. With Alternative 4, the soils contaminated with dioxin levels above 20 ppb would be excavated from Times Beach and treated in a temporary onsite thermal treatment facility. Unlike Alternatives 1 through 3, this alternative would involve thermal treatment of the soils from M/S/RC and the other identified sites at Times Beach. Ash from the incineration process would be delisted and land disposed onsite (at Times Beach) as a solid waste in a new unit designed in accordance RCRA Subtitle D and the Missouri Solid Waste Management Law and regulations.

Following completion of thermal treatment of the contaminated soils, the temporary thermal treatment facility would be dismantled and removed from Times Beach. Excavated areas within Times Beach would be backfilled to original grade with clean soil. Grading would be performed as necessary to re-establish site drainage.

As with all of the other alternatives, all areas at Times Beach with surface dioxin levels exceeding 1 ppb but less than 20 ppb would be covered with a 12-inch vegetated layer of clean soil.

Alternative 5

- Onsite land disposal of the contaminated soils exceeding 20 ppb at Times Beach.
- Offsite land disposal at Times Beach of the contaminated soils and debris from the M/S/RC site.
- Potential offsite land disposal at Times Beach of the contaminated soil and debris from other sites listed in Table 1.
- Demolition and onsite disposal of the structures remaining at Times Beach.
- Placement of a one-foot soil cover over portions of Times Beach with residual dioxin levels between 1 and 20 ppb.

Alternative 5 would involve land disposal of all the dioxin contaminated soils. All of the contaminated soils from the eastern Missouri dioxin sites would potentially be brought to Times Beach and disposed of with the Times Beach soil in an above-grade hazardous waste disposal facility. The facility would be designed to meet the RCRA requirements for a hazardous waste land disposal facility and would be flood-protected.

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

The five alternatives were evaluated using evaluation criteria presented in EPA Directive 9355.3-02, "Draft Guidance on Preparing Superfund Decision Documents: The Proposed Plan and Record of Decision." These criteria relate directly to factors mandated by CERCLA in Section 121 and considerations which measure the overall feasibility and acceptability of the remedy. These evaluations are summarized below.

Protection of Human Health and the Environment

Protection of human health and the environment is the central mandate of CERCLA, as amended by SARA. Protection is achieved by reducing risks to acceptable levels and taking action to ensure that there will be no future unacceptable risks to human health and the environment through any exposure pathway. Different remedial alternatives will have varying long-term and short-term impacts on the protection of human health and the environment.

All alternatives evaluated in this document provide some degree of protection of public health and the environment. The degree of protection and the permanence of the protectiveness vary between the alternatives. Alternatives involving excavation of contaminated soils from the uncontrolled situation at Times Beach would provide a higher long-term degree of protection for human health and would minimize the need for ongoing operation and maintenance (O&M) activities and land use restrictions. Alternatives involving long-term management of the soil in-place or in a disposal unit would require more extensive monitoring and maintenance and reliance upon land use and access restrictions to adequately protect human health and to assure the continued effectiveness of the remedy.

Dioxin levels remaining following removal of soils exceeding health-based levels for designated non-residential land usages represents a greatly reduced risk to human health and the environment relative to levels currently present at Times Beach. The one-foot vegetated soil cover which is proposed for areas exceeding 1 ppb dioxin would further reduce risk by providing both a barrier against potential exposure and dilution of subsurface soils in the event of soil disturbance.

Both treatment and disposal were considered for final management of contaminated soils. Land disposal results in some risk of future release from the disposal facility as long as the dioxin remains in the environment. Thermal treatment of contaminated soil destroys dioxin to undetectable levels, permanently removing the contamination from the environment and eliminating the need for continuing maintenance or monitoring of the treated material.

Protection of the Environment: The primary environmental concern at Times Beach is the potential migration of dioxin into the Meramec River. Contaminated sediment has been detected in roadside drainageways, but there is no indication that a significant amount of this material is reaching the Meramec River yet. Sediment and fish samples collected to date do not indicate that Times Beach is contributing a significant amount of dioxin into the Meramec. Romaine Creek is believed to be a primary contributor of dioxin into the Meramec due to the presence of several confirmed dioxin sites in the Romaine Creek watershed. Biota samples collected upstream and downstream of Times Beach in

1984 do not display a significant difference in dioxin levels. The data from this study indicate that dioxin levels in Meramec River biota are primarily due to sources downstream of Times Beach.

A limited potential exists for Times Beach to contribute dioxin into the Meramec River during flood events, because flow occurs over the Times Beach river banks. This potential will be substantially reduced by all of the alternatives being considered for the contaminated soils at Times Beach because of the reduction of surface dioxin concentrations. In addition, the Times Beach Spur Levee Project is nearing completion, which will result in permanent measures to control erosion potential at Times Beach in the event of flooding.

The placement of a one-foot cover over areas above 1 ppb in addition to removal of soils above 20 ppb would reduce or eliminate the existing potential for environmental impairment. The continued integrity of the soil cover would not be critical for maintaining the effectiveness of the remedy if all soils exceeding 20 ppb were first removed, because this reduction in surface concentration alone would substantially reduce any potential for environmental impact from Times Beach soils. Isolated breaches of the soil cover would not be of concern due to the negligible impact on overall average surface concentrations. Future contaminant degradation and mixing of soils through natural processes is expected to further reduce residual dioxin concentrations and the potential for environmental impairment.

Protection of Human Health: In this document, EPA establishes a cleanup level for dioxin-contaminated soils at Times Beach. Cleanup levels have previously been established for all portions of M/S/RC.

A cleanup level of 20 ppb has been recommended by Federal and State health agencies for the protection of public health at Times Beach, based upon non-residential land usage. The Agency believes that the continued non-residential usage of Times Beach is assured through a combination of existing contractual and statutory controls and practical considerations.

The Federal Emergency Management Agency, the State of Missouri, St. Louis County, and the Trustee for the City of Times Beach entered into a four-party contract in 1983 for the permanent relocation of residents and businesses. This four-party contract requires that future land use at Times Beach be limited to only that usage which the Missouri Department of Health and the Centers for Disease Control deem safe. In addition, no portion of the site can be conveyed by the State unless approved by state and federal health agencies, after consultation with EPA.

Times Beach is listed on the State of Missouri's Registry of Abandoned or Uncontrolled Hazardous Waste Disposal Sites.

Missouri law requires that the State must concur with any request to change the land usage of a site on this registry. By this mechanism, the State of Missouri has an additional measure of control over future land use at Times Beach.

In addition to these contractual and statutory controls, practical considerations exist that preclude future residential usage of Times Beach. The previous development of Times Beach from a recreational area to a year-round residential area primarily occurred in the absence of major flooding. In fact, no major floods occurred at Times Beach during the period between 1919 and 1942. The frequency of major flooding of Times Beach has increased in later years. The continued development of the Meramec River watershed contributes to this increased frequency. A substantial portion of Times Beach is currently located in the five-year floodplain of the Meramec River, and all of Times Beach is located in the 25-year floodplain. Future residential development is not practical in an area which is subject to such frequent flooding.

Restoration of Times Beach to residential usage would also not be cost-effective. The cost to protect the contaminated portion of Times Beach from the 100-year flood was estimated at $31 million in the 1984 Times Beach Flood Control Study prepared by the U.S. Army Corps of Engineers. Protection of the site from the Standard Project Flood was estimated at $63 million. This cost is in addition to measures taken to remediate the dioxin contamination to levels acceptable for residential usage. The increase in value of the land at Times Beach with residential usage is not commensurate with the additional cost of restoring Times Beach to allow residential usage. There does not exist a financial incentive to restore Times Beach to allow future residential development.

In-place containment of the Times Beach soils (Alternatives 1 and 2) would attain the objective of reducing surface concentrations of dioxin to an acceptable level. Monitoring and maintenance requirements would be more extensive than for alternatives involving the removal of contaminated soils. Eventual replacement of the cover or cap may become necessary. Land use restrictions would also be necessary to protect the soil cover and prevent possible human exposure in the event of cover failure. In the event of cap failure, there would be potential for offsite migration and human exposure.

Land disposal of the contaminated soils in a permanent facility meeting RCRA design criteria (Alternative 3) would provide a higher degree of protection to public health and the environment than in-place containment alternatives. There would be some risk of release due to failure of the disposal facility. This risk should be minimal if the disposal facility is properly designed, constructed, and maintained. Regular monitoring and maintenance would be required to assure the continued integrity of the land disposal facility. Access restrictions would also be required to protect the disposal facility and prevent possible human exposure in the event of a facility failure. Facility failure could potentially release a substantial volume of contaminated soil into the environment during flood events because all contaminated soils would be consolidated in one location.

An increased short-term risk associated with soil-disturbing activities is associated with all of the alternatives involving excavation and handling of dioxin-contaminated soil. This short-term risk is due to potentially contaminated dust which could be created during excavation activities. Mitigative measures, such as dust suppression, are available to control this potential risk.

Thermal treatment alternatives represent technologies which have achieved destruction of dioxin in soils to undetectable levels. These alternatives provide the greatest level of long-term protection of human health and the environment of the alternatives evaluated in the feasibility study because the toxicity, mobility, and volume of contaminated materials would be substantially reduced in comparison to the containment alternatives.

During thermal treatment, there would be a short-term potential for dust and particulate generation during materials handling and preparation activities. The potential for air releases of products of incomplete combustion also exists. Measures would be taken to ensure that all these potential hazards are controlled prior to full-scale operation. Workers would be protected through measures outlined in project-specific health and safety plans and through contractor adherence to Occupational Safety and Health Act (OSHA) regulations.

Ongoing monitoring and maintenance requirements are less for alternatives involving removal of contaminated soils than for in-place containment alternatives. The Centers for Disease Control (Agency for Toxic Substances and Disease Registry) has recommended that removal of soils exceeding 20 ppb at Times Beach is protective of human health for designated non-residential land usages. Since soils exceeding health-based levels are removed, the continued integrity of any subsequent cap or soil cover is not essential to maintain the effectiveness of the remedy. In-place containment alternatives do not remove soils which exceed a level of concern for protection of human health for the designated non-residential land usage. The continued integrity of the cap or cover is therefore critical in maintaining the effectiveness of in-place containment remedies.

Specific ongoing operation and maintenance requirements for alternatives involving the removal of soils exceeding 20 ppb would be limited to annual or semi-annual inspections to verify that land use remains consistent with the level of cleanup and that widespread disturbance of surface soils does not occur. Small isolated disturbances of the soil cover would not be of concern due to the negligible impact on overall average surface concentrations. In the event that surveillance identifies areas where widespread soil disturbance has occurred, an evaluation would be required, in consultation with appropriate health agencies, to determine if corrective measures are necessary.

All alternatives involving transportation of dioxin-contaminated soils to an offsite location for treatment or disposal would require special considerations to assure the short-term protection of human health and the environment during transport. These considerations include the method of containment and transport of contaminated soil, transportation routes and scheduling of hauls.

A detailed transportation plan would be developed in coordination with the local community prior to final design. Potential transportation routes to Times Beach would be evaluated in consideration of the locations of schools, hospitals, and other public facilities. The transportation plan would also address transportation schedules and evaluate opportunities to reduce the risk of traffic accidents. Local officials would be given an opportunity to participate in the development of this plan in order to address the comments and concerns of the local community.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA, as amended by SARA, requires that remedial actions comply with applicable or relevant and appropriate requirements or standards (ARARs) under Federal and State environmental laws. Such a standard or requirement must be attained if it is determined to be either directly applicable or both relevant and appropriate. Some of the requirements discussed in this section are directly applicable to a particular aspect of a remedial alternative. Other requirements are identified as being both relevant and appropriate to a remedial alternative. Both of these categories of requirements constitute ARARs and must be attained by the remedial alternative. In some cases, requirements are identified that are relevant to a particular alternative but not appropriate under the circumstances. These latter requirements do not constitute ARARs, and their attainment is not required by the remedial alternative.

The following potential ARARs have been identified and evaluated for remedial alternatives in this Record of Decision:

- Resource Conservation and Recovery Act
- Missouri Hazardous Waste Management Law
- Federal and State Clean Water Acts
- Federal and State Transportation Laws and Regulations

- State Solid Waste Management Laws
- Clean Air Act, Missouri Air Conservation Law

These ARARs, which have the most impact on the remedy selection, are discussed below. More complete discussions of the potential ARARs are presented in the feasibility studies for Times Beach and M/S/RC.

Onsite actions, such as the disposal of structures and debris, are exempt from the need to actually obtain a State permit which is considered an administrative requirement. Nevertheless, such onsite actions are required to meet all substantive requirements of ARARs.

Remedial actions conducted pursuant to CERCLA must achieve the substantive requirements of all ARARs. CERCLA section 121(d) requires that remedial actions shall require a level or standard of control for hazardous substances, pollutants, or contaminants that attains ARARs. Levels or standards of control are basic performance objectives for the remedial action. These basic performance objectives are defined by so-called substantive ARARs.

Superfund actions conducted onsite are exempt from administrative requirements of ARARs. Requirements which do not in and of themselves define a level or standard of control are considered administrative. Administrative requirements include the approval of, or consultation with, administrative bodies, issuance of permits, documentation, and, generally, reporting and recordkeeping. The Superfund program imposes its own reporting and recordkeeping requirements to ensure that substantive levels or standards of control are being met.

Resource Conservation and Recovery Act (RCRA)

RCRA, as amended by the Hazardous Solid Waste Amendments (HSWA) in 1984, regulates the generation, transportation, treatment, storage, and disposal of hazardous wastes. As of July 15, 1986, certain dioxin-containing wastes are specifically regulated under RCRA as hazardous wastes (the "dioxin rule," 50 FR January 14, 1985). The original source of the dioxin waste that was spread at Times Beach is included in the sources of dioxin wastes listed in the dioxin rule (RCRA waste F020). However, the dioxin-contaminated soil left in place at Times Beach is not regulated by RCRA because the soil was contaminated prior to the effective date of the "dioxin rule."

For alternatives in which dioxin-contaminated soil is excavated, some portions of RCRA are applicable to the removed soil because the act of excavation constitutes generation of a RCRA listed hazardous waste. Because it would involve land disposing dioxin-contaminated soil from other sites at Times Beach, Alternative 5 would require that the land disposal unit be permitted under RCRA. Likewise, a thermal treatment unit receiving contaminated soil from offsite would require a RCRA permit.

RCRA is not directly applicable to dioxin-contaminated soils remaining in place because the actual placement of the wastes occurred prior to the effective date of the RCRA regulations for dioxin wastes. However, some portions of RCRA are relevant to some contaminated soils that remain in place. In order to constitute an ARAR, a requirement must be both relevant and appropriate. RCRA regulations would not be appropriate to undisturbed soils remaining in place containing dioxin concentrations below health-based levels, because protectiveness is achieved by the removal of soils which represent a risk to human health and the environment.

The RCRA program is delegated to the State of Missouri, with the exception of certain regulations promulgated since the Hazardous and Solid Waste Amendments in 1984. The Missouri Hazardous Waste Management Law is nearly identical to RCRA in the regulation of dioxin wastes. Significant exceptions are Missouri hazardous waste landfill siting requirements for new facilities which require a minimum of 30 feet of underlying clay (with hydraulic conductivity less than 10-7 cm/sec) and a prohibition on siting hazardous waste land disposal facilities in the 100-year floodplain.

Because RCRA is comprehensive in its regulation of all aspects of hazardous waste management, it represents the dominant regulatory scheme affecting the implementation of remedial action alternatives for dioxin-contaminated soil. The most important of the RCRA issues are summarized below.

Landfill Closure and Post-Closure Requirements: Under RCRA, closure of a RCRA-regulated land disposal facility must be accomplished either by (1) removing or decontaminating all waste residues, contaminated subsoils, structures and equipment contaminated with waste, or (2) stabilizing and capping the wastes, and complying with post-closure requirements, including maintaining a ground water monitoring system. In order to comply with RCRA, a cap would have to be sloped to promote drainage, be designed to require minimum maintenance, be protected against stormwater run-on and runoff, and be less permeable than the underlying soils.

Landfill closure requirements would constitute ARARs for the in-place containment alternatives where contaminants remain above health-based levels. In that case, the landfill closure requirements would be both relevant and appropriate, because health-based levels would be exceeded.

For alternatives involving the removal of soils, landfill closure requirements would not constitute ARARs for the soil remaining in place containing residual dioxin concentrations below health-based levels. In this case, it would not be appropriate to apply these requirements to alternatives which achieve protectiveness by removal of contaminated soils.

Delisting: RCRA allows for the "delisting" of a hazardous waste if it can be demonstrated that the waste no longer meets the criteria for which it was originally listed as a hazardous waste. Residues from the incineration of dioxin wastes are specifically listed as "toxic" hazardous waste F028, until delisted. Decontamination wastewaters, landfill leachate, and thermal treatment residues (ash, flyash, and scrubber blowdown) must be delisted if they are to be disposed in a non-hazardous waste facility.

Dioxin-contaminated soil excavated from Times Beach and the offsite locations would be listed hazardous wastes under RCRA, due to the original source of the dioxin wastes. A formal delisting petition would be required for residues generated from the thermal treatment of offsite dioxin-contaminated soils (i.e., ash) if the residues are to be subsequently managed as a solid waste.

The Land Disposal Ban: Regulations have been promulgated by EPA that will ban, except under specified conditions, land disposal of certain dioxin-containing wastes. The soils at the Minker/Stout/Romaine Creek and Times Beach sites represent dioxin-containing wastes potentially regulated by this land disposal ban. After these regulations become effective, a dioxin-containing waste can be land disposed only if it passes a certain leaching test (Toxicity Characteristic Leaching Procedure). Samples of dioxin-containing wastes from the Missouri dioxin sites have previously been subjected to a similar test (Extraction Procedure Toxicity Test), and no dioxin was detected in the leachate. It is expected that the soils from the Minker/Stout/Romaine Creek and Times Beach Sites would pass the test, and that the land disposal ban would not preclude the land disposal alternatives evaluated in the Proposed Plan and this Record of Decision.

Thermal Treatment Standards: The dioxin-listing rule establishes standards for incineration and certain types of thermal treatment. It states that incinerators treating the listed dioxin wastes must achieve a destruction and removal efficiency (DRE) of 99.9999 percent (six-nines), in addition to the other standards contained in 40 CFR 264.343 and 265.352. Residues resulting from the incineration or thermal treatment of dioxin-contaminated soils, like other dioxin-containing wastes, must be tested to determine whether detectable levels of specific categories of dioxins, chlorinated dibenzo-furans, and certain chlorophenols are present in the extracts from the waste or treatment residuals.

It is anticipated that the thermal treatment options evaluated will attain all identified applicable or relevant and appropriate thermal treatment requirements. The thermal destruction process would comply with all the applicable requirements of Part 264 Subpart O of RCRA (Subpart O specifies design requirements for operation of hazardous waste incinerators). These include a demonstrated destruction and removal efficiency (DRE) of six-nines in the exhaust gas relative to the initial dioxin concentration in the soil. Any thermal treatment unit used to treat material from offsite would require a RCRA Part B permit.

Operation of a thermal destruction unit would require that the transportable unit undergo waste-specific trial burns to demonstrate satisfactory destruction of the toxic components of the waste in accordance with RCRA Part B permit requirements. Data obtained during the trial burn would also be used to support the delisting petition for the ash and wastewater generated from the thermal treatment process.

Missouri Hazardous Waste Management Law Siting Requirements

The Missouri Hazardous Waste Management Law (HWML) siting regulations would be considered relevant and appropriate for containment alternatives (Alternatives 1, 2, and 3). Conditions do not exist at Times Beach which would allow the requirement for 30 feet of underlying clay to be met. This state requirement is intended to provide a secondary barrier of in-situ natural materials in the event of failure of the synthetic liner or other primary containment system. The intent of this state requirement is to avoid absolute reliance upon engineered containment systems, which generally have a designated design life, to provide adequate long-term control against release of contaminants into the environment.

Section 121 of SARA contains a waiver provision from an otherwise applicable or relevant and appropriate requirement if it can be demonstrated that the proposed remedy will attain an equivalent level of control. Due to the intent of the state requirement, this waiver provision could not be applied to allow substitution of the clay barrier with a synthetic liner system. However, under certain circumstances the Missouri Hazardous Waste Management Law does allow for a waiver of the requirement for a clay barrier for non-commercial facilities. It is possible that the state could apply this waiver to the requirements for construction of a hazardous waste disposal facility at Times Beach. However, construction of a hazardous waste disposal facility at Times Beach is precluded by additional state siting requirements.

The Missouri HWML regulations prohibit siting a hazardous waste land disposal facility in a 100-year floodplain. Since all of Times Beach is located within the 100-year floodplain of the Meramec River, a land disposal facility for dioxin-contaminated soils at Times Beach is not allowed by state regulations without measures to remove the facility from the floodplain. Under state requirements, flood-protection of the facility with levees or other structures does not remove the facility from the floodplain. It would be necessary to fill contaminated portions of Times Beach to an elevation above the 100-year flood height to comply with state siting requirements. The cost of this measure would greatly exceed the cost of other remedial alternatives affording a higher degree of protection of human health and the environment. A potential waiver under Section 121 from this siting requirement has not been identified.

Clean Water Act

Dredge and fill permit requirements under Section 404 of the Clean Water Act apply to any filling operation in the waters of the United States, including wetlands. A floodplain, including the floodway, is not necessarily considered to be "waters of the United States." The Army Corps of Engineers, in conjunction with the Times Beach Spur Levee Project, has determined that there are no wetlands within the Times Beach site and none of the alternatives would involve any filling activities below the ordinary high-water mark of the Meramec River. Therefore, a Section 404 permit will be not be required for implementation of any of the alternatives evaluated.

Missouri Water Quality Criteria

The State of Missouri has adopted regulatory standards for dioxin for protection of aquatic life (0.000014 ng/l) and drinking water (0.00013 ng/l). These standards are below analytical detection levels. If dioxin can be detected in a point-source discharge, these criteria are compared to the concentration of dioxin in the discharge diluted by the relative flowrate of the receiving water. None of the alternatives evaluated include discharge into the Meramec River, therefore Missouri Water Quality Criteria do not constitute ARARs.

The Missouri Department of Natural Resources (MDNR) has recommended land application of wastewater as an alternative to surface water discharge. During the thermal treatment process, wastewaters consisting of cooling and decontamination water will be generated. This wastewater will be land applied following testing to verify the absence of contamination. Land application of wastewater will be performed at or below consumptive rates, which requires approval from the state under Missouri regulations. Such approval will be obtained from the State of Missouri prior to disposing of wastewater. All substantive provisions of the Missouri regulations governing land application of wastewater will be complied with.

Clean Air Act, Missouri Air Conservation Law

The Clean Air Act and the Missouri Air Conservation Law contain permitting requirements for sources of certain types and quantities of air pollutants. During the pre-construction design of the thermal treatment facility, an assessment will be made of the type and the quantity of potential emissions. If this assessment indicates that a permit is required, a permit will be obtained. Although the RCRA thermal treatment performance standards are more stringent than Clean Air Act requirements, in most respects, emissions of some of the more conventional pollutants are not addressed by the RCRA standards. The Federal Clean Air Act program is administered by the MDNR and St. Louis County. The St. Louis County Air Pollution Control Section and Missouri Air Pollution Control Program have a "joint concurrence" agreement for regulating major sources.

Solid Waste Disposal Regulations

Missouri solid waste management regulations require that solid waste, in general, be disposed of in a landfill meeting design and operating requirements of a demolition or sanitary landfill. Missouri solid waste management regulations also require that any landfill located in a floodplain must be designed to prevent floodwater from contacting the solid waste. An additional waste category, "special waste," has been created for those solid wastes requiring handling other than normal municipal wastes. Special wastes are subject to waste-specific disposal requirements established on a case-by-case basis. Incinerator ash is generally considered a special waste. These special waste requirements may apply to the disposal of delisted incinerator ash generated from the treatment of dioxin-contaminated soil. The State of Missouri maintains that a state non-hazardous solid waste permit is required for the land disposal of the delisted ash at the Times Beach site.

Approval will be obtained from the state prior to onsite land disposal of residue (ash) from the thermal treatment process. This approval will serve to assure the State and local community that all provisions for the safe disposal of the delisted ash have been achieved. Prior to design, approval will be obtained from the state for the type of solid waste disposal facility to be constructed. The state will also designate specific solid waste disposal requirements for the incinerator ash. County solid waste disposal requirements will be considered in the design of the disposal unit for the incinerator ash.

The delisted ash resulting from thermal treatment may be considered for use as backfill material at Times Beach in combination with sufficient clean soil to maintain vegetation. Such use of the ash would constitute beneficial use of the solid waste, and would not be subject to permitting requirements which apply to traditional solid waste disposal units. State regulations require that beneficial use of a solid waste can only be conducted with approval from the state. Such approval from the state would be obtained prior to use of the ash as a component of the backfill material.

Disposal of structures and debris at Times Beach constitutes an onsite action performed pursuant to CERCLA authority, and is therefore exempt from administrative permitting requirements, although substantive requirements must be met. All substantive provisions of the state solid waste management requirements will be met for onsite disposal of structures and debris at Times Beach. These requirements include identification of the type of solid waste disposal facility required and specific solid waste management requirements for disposal of structures and debris at Times Beach. County solid waste disposal requirements will be considered in the design of the solid waste disposal unit for the Times Beach structures and debris.

Wetlands and Floodplains Regulation

Executive Order 11988: This executive order requires that any Federal agency undertaking a project in a floodplain determine whether or not practicable alternatives exist that would allow the project to be moved out of the floodplain. An eight-step process has been established to ensure that impacts on the floodplain are identified and mitigated and to ensure adequate public participation in the decision.

EPA has prepared a floodplain assessment for Times Beach. This and other components of the CERCLA remedy selection process assure compliance with the Executive Order.

The remedy selection process under CERCLA involves identifying and evaluating alternatives for site remediation. As a result of this remedy selection process, it has been determined that no practicable alternatives exist to implementation of the project in the floodplain of the Meramec River. Offsite capacity for management of dioxin contaminated materials at Times Beach and M/S/RC has not been identified. It is not feasible to implement the preferred alternative at the M/S/RC site due to the absence of sufficient area to implement the project. Establishment of a new offsite facility for implementation of the preferred alternative would involve considerable delays during siting, development, and permitting activities. An unacceptable level of exposure would continue to occur during this delay. In addition, it has been determined that it is cost-effective to implement the preferred remedy at Times Beach, since the land is being acquired as a result of the permanent relocation, and no additional land will have to be purchased, leased, or otherwise acquired to implement the project.

Executive Order 11990: This order relates to activities that impact or modify wetlands. As noted above, the Army Corps of Engineers has determined that no wetlands exist at the Times Beach site.

Reduction of Toxicity, Mobility, or Volume

This evaluation criterion relates to the performance of a technology or remedial alternative in terms of eliminating or controlling risks posed by the toxicity, mobility, or volume of hazardous substances.

The inplace containment alternatives (Alternatives 1 and 2) would reduce the mobility of the contaminated soils. However, the toxicity and volume of the contaminants would remain at current levels. If in the future it is determined that removal of contaminated soil is required, removal of the uncontaminated cap would also be necessary. It would be difficult to completely segregate the cover material from the underlying contaminated soil during removal. Thus, the volume of material possibly requiring future management would be increased by the additional volume of the cover or cap.

Land disposal of contaminated soil (Alternatives 3 and 5) would provide greater assurance against contaminant migration than in-place containment. However, the toxicity and volume of the wastes would remain at current levels.

Thermal treatment (Alternative 4) is capable of reducing dioxin levels in soil to undetectable levels. Thermal treatment permanently removes the contaminants in the treated soils from the environment, thereby eliminating mobility and toxicity. Placement of a soil cover over areas exceeding 1 ppb dioxin following removal of soils exceeding health-based levels for the designated non-residential land usage would further reduce the potential for mobility of contamination. Following delisting, the volume of the wastes, while reduced to some extent in the incineration process, would no longer be relevant since the wastes would no longer be hazardous.

Short-Term Effectiveness

Short-term effectiveness measures how well an alternative is expected to perform, the time to achieve performance, and the potential adverse impacts of its implementation.

Of the alternatives evaluated, in-place containment of contaminated soils would provide the highest level of short-term protection. Short-term protection is high because implementation of in-place containment does not involve excavation or other soil-disturbing activities which could potentially impact site workers or the surrounding community.

Alternatives involving the excavation and subsequent management of contaminated soils provide increased opportunity for exposure to contaminants by site workers due to soil-disturbing activities. Thermal treatment and land disposal alternatives would require additional soil handling operations to render the soil suitable for treatment or disposal. Measures could be implemented which would control the potential for worker exposure during soil-disturbing and handling activities. These measures include use of protective clothing and effective dust control. These same measures would also assure the short-term protection of the surrounding community during periods of excavation and soil handling.

A limited potential exists for contaminants to be emitted into the air during operation of the thermal treatment unit. The thermal treatment unit would be equipped with redundant safety features and operated under strict conditions which would control the potential for any hazardous emissions from the thermal treatment unit to occur.

The time to achieve protectiveness varies widely among the alternatives evaluated. Implementation of in-place containment alternatives for the Times Beach soils could be completed within 15 to 19 months after completion of design, depending upon the complexity of installation and cap design. Onsite land disposal of contaminated soils from Times Beach could be implemented within 19 months of completion of design. Land disposal at Times Beach of the contaminated soil from the Minker/Stout/Romaine Creek site could be implemented in approximately 14 months, depending on excavation schedules, soil volume and permitting delays.

The time required to thermally treat contaminated soils is dependent upon a number of factors, including the capacity of the thermal treatment unit and the amount of time that the unit is down for maintenance or repairs. Treatment times were estimated by assuming a treatment capacity of 4.25 cubic yards per hour and 70% on-line efficiency (approximately 100 tons per day). These estimates do not include allowances for site preparation, mobilization and demobilization, which will increase the total implementation time by approximately two years. The net treatment time for contaminated soils from Times Beach and the Minker/Stout/Romaine Creek site is estimated at twelve months. Thermal treatment of 66,600 cubic yards of soil from the other designated eastern Missouri dioxin sites could be completed within approximately 31 additional months. This results in a total potential project duration of approximately six years.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence addresses the long-term protection and reliability an alternative affords.

In-place containment alternatives provide the lowest degree of long-term effectiveness and reliability of the alternatives evaluated. Frequent inspection and maintenance of the cap or cover would be required, including mowing, fertilizing, and repair. In addition, access restrictions would be required in order to prevent possible disturbance of the cap or cover. Ground water monitoring may be required to verify that dioxin is not contaminating ground water.

Land disposal offers considerable long-term effectiveness and reliability. Siting a permanent disposal facility in a floodplain would increase the potential for eventual failure. Continued management of the facility would be required to maintain the effectiveness of the remedy.

Thermal treatment alternatives provide the highest degree of long-term protection and reliability of the alternatives evaluated. As noted above, thermal treatment results in the destruction of dioxin in the treated soils and eliminates the potential for future exposure to this contaminated material. Ongoing maintenance requirements are greatly reduced relative to the other alternatives considered involving in-place containment or land disposal. Since the contamination exceeding health-based levels for the designated non-residential land usage is destroyed, future monitoring involving soil testing would be required only upon the advice of health agencies in the event of large-scale soil disturbance. Seasonal maintenance, including mowing, fertilizing, and control of erosion would be adequate to assure the continued protection of human health and the environment.

Implementability

Implementability considerations address how easy or difficult, feasible or unfeasible, it would be to carry out a given alternative from design through construction, operation, and maintenance.

The implementability of in-place containment alternatives is limited by several technical problems. Establishing vegetation would be difficult on a thin soil layer covering an impermeable membrane. The impermeable membrane would disrupt the natural percolation and infiltration processes, impacting soil moisture conditions. An impermeable membrane placed at a shallow depth below the surface would also limit the depth of root penetration and reduce drought tolerance. The membrane would force lateral movement of water infiltrating from the surface following rain events or flooding. This lateral movement could potentially transport soil particles, resulting in gradual depletion of the soil cover.

Installation of a cap meeting RCRA standards would also be difficult to successfully implement. The RCRA design guidance should be considered in the design of a cap or cover system. This guidance specifies a vegetated top cover, a middle drainage layer, and a low permeability bottom layer. This type of cap over roadways in Times Beach may be aesthetically objectionable and is not practical due to site drainage difficulties which could cause unhealthy conditions to develop. The cap design would require modification to achieve an equivalent level of control while minimizing cap thickness. For purposes of this evaluation, the thickness of the low permeability bottom layer was reduced to twelve inches, resulting in a total cap thickness of four feet. Installation of a four-foot-thick cap over the contaminated roadways in Times Beach would still result in considerable drainage problems. Allowances for effective drainage of uncontaminated areas would have to be provided in the design.

Implementation of onsite disposal would be relatively straightforward. The disposal facility would have to be flood-protected or designed to withstand regular flooding. An attempt by EPA in 1984 to construct a land disposal facility at Times Beach was unsuccessful due to State administrative and legislative action which eliminated funding for the required State cost share. The public was opposed to construction of a disposal facility at Times Beach at that time, and have continued to express opposition to any type of permanent hazardous waste management facility at the site.

If a disposal facility were designed to accept contaminated soil from offsite, a RCRA Part B permit would be required. Public participation requirements would be followed during the permitting process for the disposal unit.

Implementation of thermal treatment involves relatively complex technologies. These measures have been successfully implemented during the cleanup of other Superfund sites. The time required to complete thermal treatment varies depending upon treatment capacity and volume of waste. Multiple thermal treatment units could be used concurrently in order to decrease the time required to complete the remedy.

Routine maintenance and monitoring of the thermal destruction unit would ensure reliability and minimize the potential for failure. If monitoring indicates the potential for failure of the thermal destruction unit, the unit would be shut down until corrective measures are taken. Operation of thermal destruction units has shown that they are capable of successfully destroying dioxin-contaminated materials and are able to meet applicable or relevant and appropriate requirements. In addition, operation of the EPA mobile incinerator system has demonstrated that the residues from the treatment of dioxin-contaminated materials can be successfully delisted. Sufficient disposal capacity exists onsite for final disposal of the treatment residues.

Full-scale implementation of onsite thermal treatment units at hazardous waste sites has been limited. Some such units have experienced extended periods of downtime. It is possible that operation of a unit at Times Beach would also result in some extended downtime periods. The projected schedule for the cleanup of Times Beach does allow for 30 percent downtime. Downtime exceeding this allowance could delay the completion of thermal destruction of contaminated soils.

Cost

CERCLA requires that EPA select the most cost-effective (not merely the lowest cost) alternative that protects human health and the environment and meets the other requirements of the law. EPA is currently proposing remedial alternatives for only Times Beach and Minker/Stout/Romaine Creek. The five alternatives would involve costs ranging from $23.8 million to $48.8 million for these two sites. The degree of protection offered by the alternatives also varies. Comparisons of these differing levels of costs for differing levels of protectiveness constitute the cost-effectiveness evaluation EPA makes as part of the analysis in selecting an alternative.

In order to ensure that the most cost-effective alternative is selected, a detailed cost estimate is required. EPA has prepared cost estimates in the form of tables which are attached to this Record of Decision. (Attachment 2)

As noted previously, EPA cannot evaluate just the current costs for remediating these two sites in isolation. There are other considerations which also impact cost-effectiveness and must be evaluated. Specifically, EPA must consider the potential need for response at the other eastern Missouri dioxin sites (see Table 1), and determine how the current decision for Times Beach and Minker/Stout/Romaine Creek may affect the overall costs for the entire eastern Missouri dioxin problem.

Accordingly, the overall alternatives include response actions which were assumed for the other sites and which represent EPA's best judgment as to the most likely alternative to be selected. This has been done so that total costs for cleaning up all of the eastern Missouri sites can be estimated and compared. Estimates of the costs for cleaning up all of the eastern Missouri sites (including Times Beach and M/S/RC) range from $57.1 million to $118.2 million. The impacts of the current decision for Times Beach and M/S/RC on these total costs must be considered in selecting a remedy for the two sites.

The amounts of money that would be required to implement the alternatives for Times Beach and M/S/RC alone appear below. These are the costs that will be associated with the decision that EPA is currently preparing to make.

Alternative 1.	$31.4 million
Alternative 2.	$29.4 million
Alternative 3.	$26.4 million
Alternative 4.	$48.8 million
Alternative 5.	$23.8 million

In order to determine the impact of the decision for Times Beach and M/S/RC on the total costs EPA and the state will potentially incur in remediating all of the eastern Missouri dioxin sites, estimates have been prepared of the total costs of the alternatives:

Alternative 1	$112.1 million

- RCRA equivalent cap over the contaminated areas exceeding 20 ppb at Times Beach; vegetated soil cover over areas 1-20 ppb.

- Offsite thermal treatment of the contaminated soils and debris at the M/S/RC site at a location other than Times Beach.

- Offsite thermal treatment of the contaminated soil and debris from the other sites listed in Table 1 at a location other than Times Beach.

- Demolition and onsite disposal of the structures remaining at Times Beach.

Alternative 2 $110.1 million

- An impermeable (non-RCRA) cap over the contaminated areas exceeding 20 ppb at Times Beach; vegetated soil cover over areas 1-20 ppb.

- Offsite thermal treatment of the contaminated soil and debris at the M/S/RC site at a location other than Times Beach.

- Offsite thermal treatment of the contaminated soil and debris from the other sites listed in Table 1 at a location other than Times Beach.

- Demolition and onsite disposal of the structures remaining at Times Beach.

Alternative 3 $107.1 million

- Onsite land disposal of the contaminated soils exceeding 20 ppb at Times Beach; vegetated soil cover over areas 1-20 ppb.

- Offsite thermal treatment of the contaminated soil and debris at the M/S/RC site at a location other than Times Beach.

- Offsite thermal treatment of the contaminated soil and debris from the other sites listed in Table 1 at a location other than Times Beach.

- Demolition and onsite disposal of the structures remaining at Times Beach.

Alternative 4 $118.2 million

- Onsite thermal treatment of the contaminated soils exceeding 20 ppb at Times Beach; vegetated soil cover over areas 1-20 ppb.

- Offsite thermal treatment of the contaminated soils and debris from the M/S/RC site at Times Beach.
- Offsite thermal treatment at Times Beach of the contaminated soil and debris from the other sites listed in Table 1.
- Demolition and onsite disposal of the structures remaining at Times Beach.

Alternative 5 $57.1 million

- Onsite land disposal of the contaminated soils exceeding 20 ppb at Times Beach; vegetated soil cover over areas 1-20 ppb.
- Offsite land disposal of the contaminated soils and debris from the M/S/RC site at Times Beach.
- Offsite land disposal at Times Beach of the contaminated soil and debris from the other sites listed in Table 1.
- Demolition and onsite disposal of the structures remaining at Times Beach.

Considering the increased protectiveness and long-term reliability of incineration, and the impacts on the costs of the overall solution, the most cost-effective alternative is Alternative 4. This alternative does not represent the lowest cost alternative. The increased cost over other alternatives is justified by the benefits offered by Alternative 4, which none of the other alternatives offer to the same extent. The cost-effectiveness is especially clear when the total costs of the overall solution are compared.

Community Acceptance

This evaluation criterion addresses the degree to which members of local communities support the remedial alternatives being evaluated.

The local communities have demonstrated divided support for the various alternatives evaluated due to short-term remedial action impacts and aesthetic impacts. Many residents of the neighboring community of Eureka perceive the implementation of any onsite disposal or thermal treatment alternatives as a threat to the economic development and stability of their community. Some Eureka residents have proposed that a remedial action be implemented consisting of installation of an impermeable membrane covered with a vegetated soil layer. Other local residents have indicated support of centralized thermal treatment of soils from Times Beach and other eastern Missouri dioxin sites.

Public support varies depending upon whether the remedy to be implemented at Times Beach addresses onsite soils only, or includes soils from other eastern Missouri sites. Concerns of residents near Times Beach differ from the concerns of residents impacted by the other sites. Residents near the M/S/RC site and other eastern Missouri dioxin sites are supportive of establishing management capacity for contaminated soils from their respective sites. Residents near Times Beach desire to minimize the magnitude of the remedy and associated public attention drawn to their community.

Residents near Times Beach have expressed as their primary concern the establishment of a permanent hazardous waste management facility at Times Beach. Nearby residents have expressed possible support of centralized thermal treatment if they can be assured that the material to be transported to Times Beach for treatment will be limited to designated materials and that Times Beach would not become a permanent treatment facility. Concern has also been raised about the level of truck traffic associated with operation of a central thermal treatment unit at Times Beach, and possible airborne emissions. The detailed transportation plan developed in coordination with the local community prior to implementation will address many of these concerns.

Nearby residents have expressed concern regarding possible noise which may be generated during routine operation of an onsite thermal treatment unit and/or associated air pollution control equipment, materials handling equipment, and materials pretreatment equipment. Any such noise should not be detectable from the adjacent community. Any components of the thermal treatment unit which generate an unacceptable level of noise can be housed in insulated facilities or have other measures implemented which will reduce noise to an acceptable level.

State Acceptance

State acceptance addresses the concern and degree of support that the State government has expressed regarding the remedial alternative being evaluated.

The State has supported thermal destruction of dioxin-contaminated soils excavated from eastern Missouri dioxin sites at a central location. Support of this concept was initially advanced by former Missouri Governor Christopher Bond in a December 8, 1982, correspondence to the EPA Assistant Administrator for the Office of Solid Waste and Emergency Response. In this correspondence, it was requested that contaminated soils be excavated and that the possibility of incineration should be explored. The Governor, at that time, expressed willingness to provide the required ten percent State cost share to assist in this effort.

On February 14, 1983, Governor Bond, by executive order, established a Governor's Task Force on Dioxin. The task force submitted its final report to the Governor on October 31, 1983, recommending that dioxin-contaminated soil at sites in Missouri be excavated and stored until a proven technology is available to assure a comprehensive and permanent solution to dioxin contamination with minimum risk to public health and the environment. The EPA believes that thermal treatment represents such a proven technology.

The State of Missouri has operated a test facility at Times Beach since 1984, which allows independent researchers to evaluate the effectiveness of dioxin destruction technologies in the field. To date, only thermal treatment technologies have demonstrated success at reducing contaminant levels in soils to the extent required for delisting of the waste and protection of human health.

In correspondence of May 7, 1986, the State requested that EPA evaluate Times Beach for establishment of a centralized thermal treatment facility to accept dioxin-contaminated soils from eastern Missouri. This alternative was evaluated in the feasibility study and proposed plan prepared for Times Beach.

In correspondence of March 18, 1988, the State commented on the Times Beach Proposed Plan and provided conditions and restrictions necessary for their support of the proposed remedy. The conditions and restrictions requested by the State have been incorporated into this Record of Decision, and are discussed individually in the Responsiveness Summary.

The State in its comment on the Proposed Plan asked EPA to strongly consider cleaning up all areas exceeding 10 ppb. The EPA understands this request to represent the State's desire for additional soils containing dioxin levels between 10 and 20 ppb to be excavated, thereby reducing or eliminating future operation and maintenance costs. The EPA has determined that removal of soils containing dioxin levels less than 20 ppb is not required to achieve protection of human health or the environment.

X. THE SELECTED REMEDY

Based on the information available to evaluate the remedial options against these nine remedy selection criteria, EPA has concluded that Alternative 4 provides the most acceptable balance of factors in comparison to the other alternatives evaluated. This alternative is protective of human health and the environment, cost-effective, attains ARARs, and utilizes permanent solutions and resource recovery technologies to the maximum extent practicable. Additionally, because this alternative employs thermal destruction to eliminate the principal threat at the site, this option also satisfies SARA's preference for remedies which utilize treatment as their principal element to reduce toxicity, mobility, and volume.

The selected remedy is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Contingency Plan (NCP); 40 CFR Part 300 et seq.

Although this remedy would require measures to control possible short-term risks related to its implementation, the Agency's analysis indicates that all of these risks can be satisfactorily controlled. Additionally, any short-term risks appear heavily outweighed by the long-term effectiveness and degree of permanence this remedy would provide. The Agency believes this remedy would avoid the long-term uncertainties associated with land disposal.

The remedy selected by the EPA for Times Beach and the Minker/Stout/Romaine Creek site includes excavation of soils exceeding 20 ppb at Times Beach and thermal treatment of the excavated soils from both Minker/Stout/Romaine Creek and Times Beach in a temporary thermal treatment unit to be constructed at Times Beach. All areas at Times Beach with residual dioxin levels above 1 ppb will be covered with a minimum of one foot of clean soil. The selected remedy also includes demolition and onsite disposal of the structures and debris at Times Beach.

Interim storage of contaminated soils at the Minker/Stout Romaine Creek site does not represent a final remedy of this material. The storage facilities are not designed for permanent management of dioxin-contaminated soils, and could eventually fail resulting in release of contaminants into the environment. Final management consisting of treatment or disposal of this material is necessary to assure long-term protection of human health and the environment. The Agency has determined that thermal treatment of this material at a temporary facility located at Times Beach satisfies remedy selection criteria under CERCLA to a greater extent than the other alternatives evaluated.

The selected remedy will include construction of a ring levee to protect the thermal treatment facility from a 100-year flood. A thermal treatment unit will be temporarily located in the flood-protected area to treat contaminated soils from Times Beach and Minker/Stout/Romaine Creek. The northwest section of Times Beach has been identified as a potentially advantageous location for the thermal treatment unit because construction of the facility in this location will minimize visibility from Interstate 44 and reduce the impact on upstream or downstream flood heights. The actual location of the thermal treatment unit will be determined during the design phase. It is the Agency's intent to minimize visibility of the facility from Interstate 44 and local residences. The local community will have an opportunity to provide comments on the proposed location prior to development of the final design.

Delisted ash from the thermal treatment process will be land disposed on site according to the provisions of RCRA Subtitle D and the Missouri Solid Waste Management law and regulations. A portion of the delisted ash may be used in combination with clean soil as backfill material, if in accordance with these solid waste management requirements. All excavated areas within Times Beach will be backfilled with a minimum of one foot of clean soil, or to original grade in areas where excavation exceeds one foot. In addition, all areas with residual dioxin concentrations above 1 ppb will be covered with a minimum of one foot of clean soil.

The selected remedy also includes demolition and onsite land disposal of uncontaminated structures and debris located within Times Beach. This action is described as Alternative 2 for uncontaminated structures and debris in the Times Beach Feasibility Study. The volume of the structures and debris may be reduced by baling or air curtain destruction in accordance with state requirements, if approved by the state. One or more solid waste disposal units will be designed and constructed for disposal of this material in accordance with substantive provisions of RCRA Subtitle D and the Missouri Solid Waste Management Law and regulations. Among other requirements, any solid waste disposal facility constructed in a floodplain must be designed to prevent floodwater from contacting the solid waste. The actual design of the solid waste disposal facility will be determined in consideration of site-specific and remedy-specific factors.

It is the intent of EPA to prioritize the disposal of the most visible of the structures and debris at Times Beach. Design and construction of the solid waste disposal facility for the structures and debris at Times Beach will commence immediately upon ROD signature. Demolition and disposal of the structures and debris located in uncontaminated areas will begin as soon as the disposal facility is ready to accept this material. The uncontaminated portion of Times Beach which will be addressed initially generally includes the area south of Interstate 44, and the area north of the interstate and south of Blakey Road and Lewis Road. This will result in the removal and disposal of the structures and debris most visible from Interstate 44. The cleanup of structures and debris located in contaminated areas will be performed following removal of contaminated soil in order to avoid the additional cost of protective equipment.

Prior to construction of the ring levee, all soil exceeding 20 ppb will be removed from the construction area, utilizing the standard protocol EPA has developed for dioxin-contaminated soil sampling and excavation. This removed material will be temporarily stored onsite pending availability of the flood-protected thermal treatment unit. Temporary storage will take place in accordance with appropriate RCRA provisions. All excavated portions of the construction area will be backfilled with at least one foot of clean material, or to original grade in areas where excavation exceeds 1 foot. A one-foot soil cover will be placed over all portions of the construction area with residual dioxin levels exceeding 1 ppb, and less than 20 ppb. Additional fill will be placed, graded, and compacted as necessary to facilitate implementation of the selected remedy.

The primary source of clean fill material for construction of the ring levee, backfill, and soil cover will be the former mobile home park area. Soil sampling has verified that this portion of the site is free of dioxin contamination. The excavation of this area will create a potential location for land disposal of all or a portion of the delisted ash resulting from thermal treatment or the uncontaminated structures and debris, if solid waste disposal facility requirements can be met in a cost-effective manner. Another potential source of borrow has been identified immediately adjacent to Times Beach, south of Interstate 44. Following completion of the ring levee, the floor slabs and temporary structures will be constructed within the flood-protected area to site the thermal treatment facility and ancillary equipment.

A RCRA Part B permit for the thermal treatment unit will be required from the state prior to mobilization of the unit to Times Beach. Public participation is an important component of the RCRA permitting process. RCRA permits can be issued for periods up to, but not exceeding ten (10) years according to federal regulations (40 CFR 270.50). It is anticipated that the project can be completed within six (6) years. EPA will therefore seek to permit the thermal treatment unit for a duration of six years.

The thermal treatment unit will then be transported to the site for assembly and startup operations. A trial burn will be performed prior to full-scale operation to generate data required by the RCRA Part B permit and for the delisting petition for the treatment residue (ash). During the trial burn, the dioxin destruction and removal efficiency and the effectiveness of the safety features will be verified.

An action level of 20 ppb has been established for Times Beach on the basis of recommendations from CDC. It is estimated that 13,600 cubic yards of soil at Times Beach will require removal in order to meet this action level.

Contaminated soil to be transported from the Minker/Stout/Romaine Creek site to Times Beach for treatment includes approximately 5,800 cubic yards of material previously excavated, and an estimated 6,200 cubic yards that will be excavated from the Stout area and from Romaine Creek.

Approximately 66,600 cubic yards of soil from the other identified eastern Missouri sites may eventually be removed and transported to Times Beach for treatment. Of this 66,600 cubic yards of soil, 29,000 cubic yards is currently containerized and in temporary storage at the nearby Castlewood and Quail Run sites (an additional 5,800 cubic yards is in interim storage at the M/S/RC site).

A detailed transportation plan will be developed in coordination with the local community prior to final design. This plan will evaluate potential transportation routes to Times Beach in consideration of the locations of schools, hospitals, and other public facilities. The transportation plan will also address transportation schedules and evaluate opportunities to reduce the risk of traffic accidents. Dioxin-contaminated materials will be transported only during non-peak hours. Local officials will be given an opportunity to participate in its development, including an opportunity to comment on draft versions of the plan. The comments and concerns of the local community will be considered in development of the final transportation plan.

The existing pavement covering roadways at Times Beach may be left intact during implementation of the remedial action, depending on design of the remedy. This would not result in the same degree of concern for the stability of the soil layer as for in-place containment alternatives incorporating impermeable membranes as previously described. The stability of the soil layer covering the pavement would be greater than that of a soil layer covering an impermeable barrier because of the opportunity for drainage. Due to the deteriorated condition of the macadam in most areas, infiltration through the pavement would not be completely restricted. Pavement widths throughout Times Beach are also much narrower than the width of the impermeable membrane evaluated for in-place containment alternatives. Since drainage will generally not be restricted by the existing pavement, the stability of a soil layer covering the pavement will not be adversely impacted.

Following thermal treatment of the designated soils, the thermal treatment facility will be demobilized and permanently removed from the Times Beach site. It is anticipated that thermal treatment of soil from the twenty-six (26) sites designated in Table 1 can be completed within six (6) years from issuance of the RCRA Part B permit. All temporary structures constructed for the thermal treatment facility and ancillary units will be dismantled and removed from the site. The ring levee, gravel, and crushed stone placed during implementation of the remedial action will be removed. All floor slabs remaining from thermal treatment activities will be broken up and left in place. A minimum one-foot vegetated soil cover will be placed over all demolished floor slabs constructed within the flood-protected project area. Upon establishment of vegetation, all site offices will be demobilized. Access restrictions imposed during cleanup could then be removed enabling beneficial usage of the site.

The remedy selected for Times Beach represents a final remedy for dioxin-contaminated soils and uncontaminated structures and debris located at the site. An additional investigation will be performed to characterize ground water and other organic contamination which has been identified at an isolated portion of the former city park. It is appropriate for this investigation to proceed independent of the dioxin remediation, due to the relative magnitude of the dioxin contamination problem and the fact that the two problems and their solutions are not interrelated.

If, during implementation of the remedial action at Times Beach, thermal treatment of contaminated soils located in the former city park area is determined to be necessary and consistent with CERCLA remedy selection criteria, the thermal treatment unit located onsite may be considered for this action. This would constitute a separate remedial action requiring compliance with the CERCLA remedy selection process, which includes public notice and comment. No other material from any location not listed in Table 1 will be considered for treatment at Times Beach.

In certain areas following implementation of the selected remedy, dioxin concentrations up to 20 ppb will remain at depth, beneath a minimum of one foot of clean soil. The soil cover provides both an additional protective barrier and an effective means of diluting contaminated subsurface soils in the event of future soil disturbance.

Because unrestricted use of the site would not be allowable, the 5-year review provision of SARA, Section 121(c), would apply. This review will evaluate the continued effectiveness of the remedy and determine if land use remains acceptable to federal and state health agencies. The evaluation will also determine whether continued land use restrictions are warranted and whether existing land use restrictions will remain effective for an additional five year period. Additional actions will be taken, as necessary, to maintain the effectiveness of the remedy.

Ongoing operation and maintenance requirements would include periodic inspections to verify that future land use remains consistent with the intended site usage based upon the degree of cleanup. Inspections would also be directed at identifying widespread areas of soil disturbance or removal. The areas requiring periodic surveillance may be designated to facilitate identification. Seasonal maintenance would include mowing, fertilizing, and control of erosion.

Large-scale removal or disturbance of soils at Times Beach following implementation of the selected remedy could potentially result in concern for protection of human health and the environment. Small isolated breaches in the soil cover would not be of concern due to the negligible impact on overall average surface concentrations. In the event that future periodic site surveillance identifies areas where widespread soil disturbance or removal of soil has occurred, an evaluation will be conducted in consultation with appropriate health agencies to determine if corrective measures are necessary.

XI. STATUTORY DETERMINATIONS

Based upon available information, the selected remedy satisfies the remedy selection requirements under CERCLA, as amended by SARA and the National Contingency Plan. The remedy provides protection of public health and the environment, achieves all applicable or relevant and appropriate requirements, is cost-effective, utilizes permanent solutions to the maximum extent practicable, and satisfies the statutory preference for remedies involving treatment technologies.

Protection of Public Health and the Environment

The selected remedy for Times Beach and M/S/RC will provide a high degree of protection of public health and the environment. No other alternative identified offers an equivalent degree of long-term protection. The remedy exceeds the level of cleanup recommended for Times Beach by state and Federal health agencies, as described in January 16, 1987 correspondence from EPA to CDC. The existing 4-party contract between FEMA, the State of Missouri, St. Louis County, and Times Beach for the permanent relocation of Times Beach residents and businesses provides an effective legal mechanism to assure that land use at Times Beach will remain consistent with Federal and State health advisories. In addition, the Missouri Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites requires that the Director of MDNR must approve any request to change the land use of a site appearing on the registry. Local zoning ordinances may be established which will provide additional assurances that land use remains consistent with the level of cleanup, and that local interests are considered prior to a change in land use.

The primary environmental concern at Times Beach is the potential release of dioxin-contaminated soil or sediment into the Meramec River. Existing sediment and biota data indicate that Times Beach is not presently a significant source of dioxin into the Meramec River. Any future environmental threat will be controlled by removal of all soils exceeding 20 ppb and placement of a one-foot soil cover over all areas exceeding 1 ppb. Construction of the spur levee project will be completed in the fall of 1988. The spur levees will control water velocities during flood events, which will minimize the potential erosion of soils and provide protection of the soil cover. These measures will insure that Times Beach does not become a source of dioxin into the Meramec River and will also provide an additional measure of protection for onsite wildlife.

Attainment of ARARs

It is anticipated that the selected remedy will achieve the provisions of every applicable, or relevant and appropriate requirement (ARARs) for the protection of public health and the environment. Requirements to be met prior to thermal treatment of soil include demonstration of six-nines destruction and removal efficiency and delisting of the thermal treatment residue. Prior experience by the Agency with the EPA mobile incinerator in southwest Missouri has indicated that both of these requirements are achievable.

Containment alternatives would not meet all identified applicable or relevant and appropriate requirements. Alternatives which leave existing levels of contamination beneath a cap or soil cover would not meet relevant and appropriate landfill closure requirements under RCRA. Alternatives involving the land disposal of contaminated soils in a facility constructed at Times Beach would not meet siting requirements under the Missouri Hazardous Waste Management Law and its implementing regulations. It is possible that the Missouri Hazardous Waste Management Law may allow substitution of 30 feet of underlying clay with a synthetic barrier which provides an equivalent level of control. A waiver from the state regulation against siting a hazardous waste landfill in a 100-year floodplain has not been identified. Measures to remove the facility from the floodplain would be required to implement containment alternatives in accordance with all identified ARARs.

Preference for Treatment

The selected remedy satisfies the statutory preference (established by SARA) for remedies involving treatment which result in the permanent reduction of the volume, toxicity, or mobility of hazardous substances. Thermal treatment destroys the dioxin contamination, thereby eliminating the toxicity of the treated soil. Since the dioxin contamination in the treated soil is destroyed, the potential mobility of this contamination is also eliminated. The mobility of the soils above 1 ppb remaining in place following removal of soils exceeding health-based levels for designated non-residential usage is controlled by the placement of a vegetated soil cover. All containment alternatives evaluated reduce the mobility of the contaminated soil, although not to the extent provided by thermal treatment. Containment alternatives do not reduce the toxicity or the volume of hazardous substances.

Cost Effectiveness

In establishing sufficient treatment capacity to manage contaminated soils from other eastern Missouri dioxin sites, substantial economies of scale will be realized, resulting in a cost-effective comprehensive remedy for the identified eastern Missouri dioxin sites.

The total cost of the remedy is largely dependent upon the actual unit cost of thermal treatment. Thermal treatment cost estimates from sources within and outside the Agency have ranged from less than $200 per cubic yard to over $1,000 per cubic yard. Based upon the best available information within the Agency, and an evaluation of projected thermal treatment costs included in the Times Beach Feasibility Study, a unit cost of $400 per cubic yard for operation of the treatment unit is used to estimate the cost of the proposed remedy. The cost of associated requirements such as flood protection, soil handling and preparation, and ash disposal are additional and increase the total projected unit treatment cost. These costs are consistent with estimates used for evaluation at other Superfund sites, including Love Canal.

The total estimated cost of the entire project potentially includes the cost of excavation, transportation, treatment, and monitoring for soils from all identified eastern Missouri sites listed in Table 1. The costs associated with excavation, transportation and monitoring are known with a high level of confidence because of EPA's extensive experience with these activities at similar dioxin sites. The potential total cost for the cleanup of all identified sites is approximately $118.2 million. The costs associated with the current remedy being selected in this Record of Decision for Times Beach and Minker/Stout/Romaine Creek alone will be approximately $48.8 million.

Although this Record of Decision discusses all of the dioxin sites listed in Table 1, decisions about the cleanup of each site will be made separately. The proposed remedy includes transport of contaminated soils from the Minker/Stout/Romaine Creek site to Times Beach for treatment, and excavation and treatment of contaminated soils located onsite at Times Beach. The thermal treatment unit mobilized for the remedial action will also be available to accept contaminated soil from the designated sites for treatment and disposal. Excavation and transportation of the soils from each designated site will be evaluated on a site-by-site basis, and funding and implementation will occur independently for each site.

ATTACHMENT 1

HEALTH ADVISORIES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

OFFICE OF
THE REGIONAL ADMINISTRATOR

JAN 16 1987

Dr. Renate D. Kimbrough
Center for Environmental Health
U.S. Centers for Disease Control
Atlanta, Georgia 30333

Dear Dr. Kimbrough:

Region VII and the State of Missouri are in the process of developing a comprehensive cleanup strategy for many of the dioxin sites in Missouri. The purpose of this letter is to request your concurrence with the cleanup strategies being considered for the Missouri dioxin sites.

To some extent, it is possible to group some Missouri dioxin sites which represent similar exposure scenarios. Similar cleanup considerations would apply to the sites within each group. Other sites represent unique situations where a site-specific cleanup approach is appropriate. Special considerations may be warranted at sites with close proximity to streams or pastures used for grazing, and some commercial areas may require special consideration due to a high potential for frequent access by children. A general discussion of the cleanup protocols being proposed for the various grouped and individual sites follows.

Residential (includes Lacy Manor, Bliss-Ellisville, Castlewood, Erxleben, and residential portion of Highway 141 Access Road)

These sites became contaminated as a result of contaminated waste oil being applied to the surface for purposes of dust control. The concentration of 2,3,7,8-TCDD in soils at these sites can be expected to decrease with depth. These sites represent scenarios where a relatively high degree of exposure could be anticipated if remedial measures are not implemented.

The proposed cleanup at these sites involves excavation and removal of surface soils exceeding an average concentration of one part per billion (ppb), initially determined prior to excavation at the 95 percent confidence level using the established sampling protocol. Excavation of soil would proceed until a residual concentration of 1 ppb is reached following removal of the initial layer of soil, or until a residual concentration of 5 to 10 ppb is reached at a depth of approximately one foot or greater. No excavation would continue beyond four feet total depth or once bedrock is encountered.

Excavated areas would be backfilled to original grade with appropriate material. If there are any contaminated subsurface soils at 5 to 10 ppb at a depth of one foot or more which might be disturbed in the future, the clean backfill would serve to cover the residual contamination sufficiently that any contaminated soil that is brought to the surface would not represent a level of concern for public health.

It would not in all cases be necessary to determine residual concentrations following excavation to the 95 percent confidence level using the established protocol. In some instances, it can be demonstrated that excavation to a particular depth effectively reduces residual concentration levels to an acceptable range. This determination can be made based on information developed during previous removal actions involving the excavation of TCDD-contaminated soil in Missouri. An evaluation of the relationship between the preliminary surface TCDD concentration and residual TCDD levels subsequent to various depths of excavation has made it possible to accurately estimate the required depth of excavation to meet cleanup criteria. Some limited sampling would still be performed following excavation in order to allow health officials to certify that the site can be removed from the state hazardous waste site registry. This limited sampling effort would be greatly reduced in scope relative to the 95 percent confidence level protocol.

Non-Residential Sites with High Exposure Potential (includes Baxter Garden Center, Community Christian Church, Manchester Methodist Church, East North Street, and residential portion of East Texas Motor Freight)

Although these sites are generally not considered to represent residential scenarios, a sufficient degree of exposure potential exists that the cleanup approach described above for residential sites is applicable. Nursery schools are operated at the two churches, and a public school is located near the East North Street site. Site activity at Baxter Garden Center may involve some direct contact of workers with potentially contaminated surface soils. Several residences are located directly across the street from the East Texas Motor Freight site.

Remediation of these sites would involve determining the surface TCDD concentrations at the 95 percent confidence level. Surface soils exceeding 1 ppb TCDD would be excavated using the same criteria established for residential areas. Excavation would proceed until one of the following is achieved: a residual concentration of 1 ppb TCDD following removal of the initial layer of soil, a residual concentration of 5-10 ppb at a depth of approximately one foot or greater, maximum depth of four feet, or bedrock encountered. Excavated areas would be backfilled to the original grade using appropriate material.

Occupational/Industrial Sites (include Bull Moose Tube, Hamill Transfer, Jones Truck Lines, Overnite Transport, Southern Cross Lumber. Arkansas Best Freight, Bonifield Brothers Trucking, and non-residential portions of East Texas Motor Freight and Highway 141 access road)

These sites represent scenarios where a limited amount of exposure occurs on an infrequent basis due to normal site activity. The existing extent and levels of surface TCDD contamination would be determined at the 95 percent confidence level. In areas where worker contact with contaminated soil does not occur on a regular basis, it would be acceptable for average surface TCDD levels up to 20 ppb to remain in place. Areas exceeding 20 ppb would be excavated until a residual concentration of less than 20 ppb would be reached.

Excavation would not proceed beyond a total depth of four feet or upon encountering bedrock. All excavated areas would be backfilled with appropriate material to the original grade.

In certain cases, it may be acceptable to leave TCDD concentrations higher than 20 ppb in place under a paved surface. Paving would be an acceptable remedial measure at the occupational/industrial sites listed in this section based on sampling results obtained to date. Monitoring and maintenance provisions would be required to assure the continued integrity of the paved surfaces at sites where average TCDD levels exceeding 20 ppb are left in place under pavement.

Because a certain level of contamination would be left in place, long-term monitoring of these sites would be required. This monitoring program would ensure that any disturbance or offsite transport of significant quantities of contaminated soils would be detected so that corrective measures would be taken. It would also be necessary to ensure that land use did not change to a situation where higher levels of exposure could occur.

Due to the proximity of the East Texas Motor Freight site to residences across the street, installation of a cap would be required as an additional measure to reduce the potential for offsite migration of contaminated soil and direct contact by nearby residents. The cap would be of appropriate design and accompanied by a long-term monitoring and maintenance program to ensure its continued integrity.

Horse Arenas (includes Timberline Stables, Bubbling Springs, Saddle and Spur Arena, and Mid-America Arena)

Routine soil disturbance in riding arenas can be expected to extend to a greater depth than the above scenarios. Removal of soil to a greater depth in horse arenas may be warranted due to this consideration. Soils in the riding area of each arena would be initially excavated to a depth of two feet. Following the initial excavation, residual contamination levels would be determined. Excavation would continue until a residual concentration of 5 to 10 ppb is reached in the two to four foot depth interval. Excavation would not extend beyond a total depth of four feet. Following excavation, the arenas would be restored by backfilling with clean material appropriate for construction of horse arenas. All sampling of the riding area would be performed using the established 95 percent confidence level protocol. Excavation of non-riding areas would proceed to the extent discussed above for residential areas, to a residual concentration less than 1 ppb in the upper foot or 5 to 10 ppb in the one to four foot depth interval.

Times Beach

The contaminated portions of Times Beach require special consideration due to the uncertainty of future land use. The approach described above for occupational/industrial sites will generally be applied with an additional measure of protection.

Contamination of Times Beach is primarily limited to road surfaces throughout the area. The proposed cleanup involves the removal of macadam or pavement from all roadways within Times Beach. This will effectively remove the upper several inches of the contaminated soils at the site. Following surface removal, sampling will be performed to determine the levels and areal extent of any residual contamination using the 95 percent confidence level protocol. Areas with average concentrations exceeding 20 ppb will be further excavated to a total depth of one foot. All roadways and any other excavated areas will then be backfilled to original grade with appropriate material and revegetated. Monitoring and maintenance will be performed to maintain the vegetative cover in contaminated portions of the site in areas where excavation has not achieved the level of cleanup described above for residential sites. If a non-residential land usage is designated by the State in the future, monitoring and maintenance will be performed in areas where TCDD levels exceed the appropriate level of concern for the designated land usage.

Piazza Road

This site represents a combination of residential, agricultural, and commercial land usage. Due to the prevailing residential usage and potential for children to have frequent access to non-residential areas, the cleanup of the entire Piazza Road site will be performed in accordance with the approach described above for residential sites.

Bliss-Frontenac

Although not located in a residential area, special considerations are warranted for this site. This area is the former location of mixing and storage tanks, which received dioxin-contaminated still bottoms directly from the source. The site became contaminated as a result of routine spills and leakage. High TCDD levels have been detected throughout the site. A stream which leads into a residential area is located adjacent to the site. Due to the high TCDD concentrations detected, areal extent of these high levels, and proximity of the stream, this site will also be remediated using the approach described above for residential sites.

Shenandoah Stables

Highly contaminated soils in the riding arena at Shenandoah Stables were excavated and deposited in what is referred to as the slough area. TCDD concentrations as high as 1,730 ppb have been detected in this area. A limited number of soil core samples have been analyzed for TCDD at approximately one-foot intervals to a depth of five feet in the slough area. TCDD concentrations have not been above 1 ppb at depths greater than two feet. However, the vertical and horizontal extent of contamination has not been completely defined. Due to the high TCDD concentrations detected and unknown depth and areal extent of contamination, excavation of the slough area will proceed until a residual concentration of 5 to 10 ppb is reached at a depth below two feet. The maximum four-foot depth of excavation will not be observed due to the high TCDD levels which may be present at depth. Excavated portions of the slough area will be backfilled with appropriate material. Excavation and restoration of the arena area and non-riding areas will proceed in accordance with the approach described above for other horse arenas.

Stout Area

The Stout portion of the Minker/Stout/Romaine Creek site became contaminated as a result of TCDD-contaminated soil being used as fill material to create a level surface for the placement of two mobile home pads. It is believed that approximately 850 cubic yards of TCDD-contaminated fill material were used as part of a much larger amount of fill required to create this level surface. It is not known how the contaminated soil is distributed throughout the fill area. For this reason, it cannot be assumed that concentrations generally decrease with depth, and surface sampling would not ensure higher concentrations do not exist below the surface. Removal of the upper four feet of existing soil in the fill area would be performed as a minimum level of remediation, unless a sampling program could be designed and implemented which demonstrated that TCDD concentrations exceeding 1 ppb are not present in the upper foot of soil, and TCDD levels exceeding 5 to 10 ppb are not present in the one to four foot depth interval. Areas adjacent to the fill area which became contaminated as a result of surface migration of contaminated soils would be remediated in accordance with the general approach described for residential areas. These areas would be excavated to a residual concentration of less than 1 ppb after removal of the initial soil layer, or 5 to 10 ppb at depths of one to four feet, as determined by surface sampling using the 95 percent confidence level protocol. All excavated areas would be backfilled with appropriate material to the original grade.

Since contaminated soils may exist at depths greater than four feet at this site, a retaining wall or other suitable engineering control would be required to stabilize the fill area and prevent potential contaminant migration. A continued monitoring and maintenance program would be required to ensure that soils below the depth of excavation in the fill area are not disturbed. Land use restrictions would be necessary to prevent future construction activities which may disturb the remaining fill material. The need for continued monitoring and land-use restrictions may be eliminated if a sampling program could be designed and implemented which would demonstrate that significant quantities or concentrations of TCDD-contaminated soil do not remain in the fill material. If such a sampling program is not feasible or shows that significant TCDD remains in the fill, it may be necessary to excavate the entire fill area in order to eliminate the need for monitoring provisions and land-use restrictions.

Structure Decontamination

Region VII has recently evaluated alternative interior surface decontamination procedures that may be appropriate for remediation of non-residential structures. The structures being considered are riding arenas, stables, and barns which are not tightly enclosed and do not have recirculating air systems. The proposed approach to the decontamination of these types of structures would consist of a single thorough decontamination effort. The procedure would include HEPA vacuuming and detergent washing, as appropriate, of all contaminated surfaces in the interior of the structure. It has been our experience in the region that this procedure will reduce TCDD concentrations below a level of concern for public health for decontamination of residences. This procedure should also reduce TCDD levels below a level of concern for public health in arenas, barns, and stables.

An additional control measure may be appropriate for Mel's Tavern at the Castlewood site. Because of the condition of this structure and the porosity of the interior surfaces, painting or otherwise sealing the contaminated surfaces may be necessary following cleanup of exterior contaminated soils to achieve undetectable TCDD levels in dust samples. Structural decontamination of Mel's Tavern will be performed in accordance with procedures developed for residential structures, previously approved by CDC.

Your assistance in the evaluation of these proposed approaches to the cleanup of Missouri dioxin sites is greatly appreciated. We anticipate that you may require additional information to complete your response. Information regarding these sites has been provided to you and your associates during our discussions, and additional explanation will be provided as required. Please contact me at your earliest convenience if you require additional information.

Sincerely yours,

/S/ 1/16/87

Morris Kay
Regional Administrator

cc: John Crellin, MDOH
Linda James, MDNR

DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service

Centers for Disease Control
Atlanta GA 30333

PRIVILEDGED AND CONFIDENTIAL (BY EPA)

January 22, 1987

Mr. Morris Kay
Regional Administrator
U.S. Environmental Protection Agency
726 Minnesota Ave.
Kansas City, Kansas 66101

Dear Mr. Kay,

In your letter of January 16, 1987 you outlined a strategy for remedial action on the sites that were contaminated with 2,3,7,8 tetratchlorodibenzodioxin (TCDD) in Missouri in the early 70s. As we have discussed previously, these sites are either used as residential areas or they represent commercial or industrial sites. However, some sites need special consideration as you also point out in detail in your letter.

I have carefully reviewed your proposals for the various sites listed. Based on the letter and additional discussions I have had with your staff, I have determined that the remedial actions proposed in your letter for these sites would restore them and they would no longer represent areas of concern for public health.

After remediation no further follow up or inspections would be necessary for most sites. For some areas the caveats as outlined in your letter such as permanent zoning restrictions at industrial sites would have to be implemented. In addition an inspection program would have to be developed for a few sites, to assure that any remedial action taken, such as permanent covers do not become disturbed by future activities. In conclusion if the contaminated sites are remediated and monitored as outlined in your management plan they would no longer represent a risk to human health.

Sincerely yours,

Renate D. Kimbrough, MD

Renate D. Kimbrough, M.D.
Medical Officer
Diplomate American Board of Toxicology
Center for Environmental Health

RECEIVED
JAN 26 1987
EPA Region VII

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

July 30, 1987

Mr. David Wagoner
Director
Waste Management Division
EPA VII
Kansas City, Kansas 66101

Dear Mr. Wagoner:

This letter is in response to your request for elaboration on the mathematics underlying the development of support for the 20 ppb cleanup level for certain Missouri dioxin sites as proposed in the letter from Mr. Morris Kay to Dr. Renate Kimbrough dated January 16, 1987. In Dr. Kimbrough's January 22, 1987 response she indicated that the proposed cleanup activities would restore the areas so that they would no longer be of concern for public health. In the enclosed memorandum from Dr. Vernon N. Houk, Director, Center for Environmental Health (CEH) dated May 8, 1987, the basic CEH guidance established for these sites was listed. In order to provide you with the assumptions and calculations underlying the CEH guidance I have included the following material from Dr. Kimbrough.

In 1984, Kimbrough et al., published a paper which examined the potential for exposure to TCDD in the environment. Since that time, new information has become available which appreciably alters the basic assumptions dealing with both the amount of soil young children ingest and the amount of absorption of TCDD from Missouri soil within the intestine. It now appears that the amount of soil ingested by small children is less than 10 grams and is more in the order of 100-2000 mg over a 24-hour period, (Binder et al., 1986). While Kimbrough et al., assumed that 30 percent of TCDD bound to ingested soil was bioavailable, subsequent tests with soil from different areas in Missouri have shown that 60 to 80 percent of TCDD may be absorbed following ingestion (McConnell et al., Science 223:1077-1079, 1984). The nature of these changes are essentially offsetting so that for Missouri soils the 1 ppb concern level in residential areas has not changed.

It has been established recently that TCDD bioavailability following ingestion of TCDD contaminated soil varies a great deal and depends on a variety of factors, such as:

- The concentration of TCDD in the soil;
- The length of time the TCDD was in contact with the soil; and
- The composition of the soil [Umbreit et al., Science 232:497499 (1986), and Umbreit et al., Society Toxicology meeting abstract 1273 (1986)].

However, the level of concern established by Kimbrough et al., as 1 ppb for residential areas has not changed because of these findings.

Based on the assumptions presented in the paper by Kimbrough et al., it can be concluded that soil in residential areas contaminated with 5 to 10 ppb of TCDD would not present a hazard if covered with 12 inches of clean soil. The rationale being that the clean surface soil would represent a barrier restricting human access to contact with the contaminated soil. In the event that the soil was disturbed, the 12 inches of clean soil would be mixed with contaminated soil and the concentration at the surface would, at most, reach 1 ppb. Thus, the risk in these areas, even after mixing of the subsurface contaminated soil with the clean cover soil would be comparable to that in other residential areas where the concentration of TCDD is 1 ppb or less at the surface. This approach would be acceptable in residential areas where the soil has not been physically disturbed by human activities.

Experience has shown, that concentrations decrease dramatically with depth in areas where the TCDD was applied to the surface. The 5 to 10 ppb/12-inch cover cleanup level would therefore be appropriate for sites like Castlewood, Times Beach, and Piazza Road. The 5 to 10 ppb would not be acceptable for residential areas where fill has been brought in from highly contaminated areas and where the levels of contamination may actually be inverted, resulting in increasing concentrations with depth.

The article of Kimbrough et al., focused primarily on residential exposure. However, the methods used to assess exposure in other situations were briefly discussed, (see pages 82-85). Basically the dose a person will receive depends on his or her activities and the ability of the TCDD to detach from the soil and enter the body. Thus, at sites which are not residential, the levels of concern may be different. For instance at a commercial site:

- Children would not play on a daily basis;
- It would be frequented by adults who would primarily walk through the area;
- It is unlikely that there would be any gardening; and
- There might be some short-term exposure during construction.

Thus, it is reasonable to assume that there would be little or no exposure. In a worst case scenario, dermal exposure of an adult to 1 gram of soil 5 times a week for 6 months per year could be assumed.

Although through ingestion of TCDD contaminated soil the amount of TCDD absorbed can be substantial, this is not true for skin absorption. As discussed in the paper by Kimbrough et al., (pp. 71-74), the most likely amount that would be absorbed would be 1 percent or less of the TCDD on the soil. Thus, the dose received from one gram of soil containing 20 ppb (20 ng/gram of soil) on the skin would be 0.2 ng or 200 picograms (pg). The dose, on a kilogram body weight basis, would be 200 pg divided by 70 kg or roughly 3 pg/kg. However, since for these small concentrations the cumulative dose is more important than the daily doses, it must also be considered that the dosing is intermittent and not for a lifetime. Furthermore, the contamination of the area is not uniform and allowances would have to be made for the percent of contamination at different concentrations.

If only 10 percent of the area were contaminated at a concentration of 20 ppb then contact with contaminated soil would not be 100 percent but the corresponding fraction thereof (10 percent in this case). Thus, the daily dose if averaged out over a lifetime, taking the above assumptions of 5 days exposure for 6 months per year for 20 years as a basis, would result in an average daily dose of 330 femtograms/kg body weight. However, if only 10 percent of an area were contaminated at 20 ppb, then the dose would more likely be one-tenth of that or 33 femtograms/kg. Thus, such contamination with the exposure scenario outlined above would represent an acceptable risk based on the paper by Kimbrough et al., (1984).

It would not, however, be acceptable to leave higher levels of contaminated soil even with a cover of 12 inches. Leaving such soil with concentrations higher than 20 ppb could pose a threat to health and the general environment if the soil were disturbed in the future.

Kimbrough et al., (1984), stated that inhalation of TCDD bound on soil was negligible (pp. 71-72). Some work has recently been advanced that TCDD volatilizes to some extent from soil (Monsanto data, Schroy et al.). However this has not been substantiated by others (Yanders et al.), and only involves the surface area immediately above the soil but not the normal breathing zone of people. Furthermore, there is also re-absorbtion and slight movement into the lower layers of the soil. Particularly, such exposures would be even more unlikely in areas which have vegetation or where the surface is covered in some other fashion. In any case, volatilization of TCDD would not contribute to the overall exposure of people frequenting the area.

In summary, these proposed levels would not deviate from the general concept presented and developed in the paper by Kimbrough et al., (1984). When the paper was developed all available information on human health effects was taken into consideration. Since that time additional health studies have been performed. They have not provided any information which would suggest that TCDD is more toxic to humans than was assumed in 1984.

Recently, the information on human health effects was reviewed (Kimbrough, R.D., and Houk, V.N., Effects of Chlorinated Dibenzodioxin as Chapter 5 in Solving Hazardous Waste Problems, ACS Symposium Series 338. ACS Washington, D.C., 1987). Chloracne and some acute health effects have been found in highly exposed workers. However, there is no evidence that low level exposure such as that which might result from TCDD in soil at a concentration of 1 ppb would result in any acute or chronic clinical or subclinical effects.

Sincerely yours,

Barry L. Johnson

Barry L. Johnson, Ph.D.
Associate Administrator

ATTACHMENT 2

DETAILED COST ESTIMATES

9/27/88

ALTERNATIVE 1
COST SUMMARY

ACTIVITY	REFERENCE	COST
"RCRA" Cap - Times Beach Soils	Table A-1	$13,149,000
Onsite Land Disposal - Times Beach Structures and Debris	Table A-2	$7,263,000
Offsite Thermal Treatment - Minker/Stout/Romaine Creek	Table A-3, A-4	$10,996,000
Offsite Thermal Treatment - Other Designated Eastern Missouri Sites	Table A-3, A-4	$80,685,000
Total Cost		$112,093,000
Annual O & M Cost	Table A-1	$284,800

9/27/88

ALTERNATIVE 2
COST SUMMARY

ACTIVITY	REFERENCE	COST
Impermeable Cover - Times Beach Soils	Table A-5	$11,146,000
Onsite Land Disposal - Times Beach Structures and Debris	Table A-2	$7,263,000
Offsite Thermal Treatment - Minker/Stout/Romaine Creek	Table A-3, A-4	$10,996,000
Offsite Thermal Treatment - Other Designated Eastern Missouri Sites	Table A-3, A-4	$80,685,000
Total Cost		$110,090,000
Annual O & M Cost	Table A-5	$284,800

9/27/88

ALTERNATIVE 3
COST SUMMARY

ACTIVITY	REFERENCE	COST
Onsite Land Disposal - Times Beach Soils	Table A-6	$8,183,000
Onsite Land Disposal - Times Beach Structures and Debris	Table A-2	$7,263,000
Offsite Thermal Treatment - Minker/Stout/Romaine Creek	Table A-3, A-4	$10,996,000
Offsite Thermal Treatment - Other Designated Eastern Missouri Sites	Table A-3, A-4	$80,685,000
Total Cost		$107,127,000
Annual O & M Cost	Table A-6	$158,200

9/27/88

ALTERNATIVE 4
COST SUMMARY

ACTIVITY	REFERENCE	COST
Onsite Thermal Treatment - Times Beach	Table A-7, A-9	$24,563,000
Onsite Land Disposal - Times Beach Structures and Debris	Table A-2	$7,263,000
Offsite Thermal Treatment - Minker/Stout/Romaine Creek	Table A-8, A-9	$17,016,000
Offsite Thermal Treatment - Other Designated Eastern Missouri Sites	Table A-8, A-9	$69,319,000
Total Cost		$118,161,000
Annual O & M Cost	Table A-7	$25,200

9/27/88

ALTERNATIVE 5
COST SUMMARY

ACTIVITY	REFERENCE	COST
Onsite Land Disposal - Times Beach Soils	Table A-10, A-12	$13,985,000
Onsite Land Disposal - Times Beach Structures and Debris	Table A-2	$7,263,000
Offsite Land Disposal - Minker/Stout/Romaine Creek	Table A-11, A-12	$2,582,000
Offsite Land Disposal - Other Designated Eastern Missouri Sites	Table A-11, A-12	$33,245,000
Total Cost		$57,075,000
Annual O & M Cost	Table A-11	$170,000

9/27/88

Table A-1
ALTERNATIVE 1 - IN-PLACE RCRA CONTAINMENT OF TIMES BEACH CONTAMINATED SOILS

SUMMARY TABLE

TIMES BEACH IN-PLACE RCRA CONTAINMENT COSTS

ASSUMPTIONS	
ACTION LEVEL IS	20 PPB
TOTAL AREA EXCEEDING ACTION LEVEL	46,500 SY
TOTAL AREA EXCEEDING 1 PPB	144,530 SY

SUMMARY	
NET DISPOSAL COST IS	$8,700,000
TOTAL CAPITAL COST** IS	$13,100,000
TOTAL ANNUAL O&M COST IS	$285,000
DURATION OF ONSITE ACTIVITIES IS	21 MO
DURATION OF CONSTRUCTION ACTIVITY IS	19 MO

**includes contingencies, permitting and legal, and design costs

Table A-1 (cont.) 9/27/88

TIMES BEACH INPLACE RCRA CONTAINMENT CAPITAL COSTS
==

COST ITEM DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
GENERAL				
Mobilization, Demobilization, Bonding, and Insurance	1	LS	8%	$455,071
Community Relations	23	MO	$6,000	$138,000
Security Guards and Trailer	23	MO	$6,500	$149,500
Health and Safety Preparations1				
Worker Physicals	100	EA	$600	$60,000
Worker Training	50	EA	$1,100	$55,000
Site Health and Safety1				
Nurse and Safety Supervision	19	MO	$37,800	$718,200
Personal Protective Equipment	1	LS	$364,500	$364,500
Decontamination				
Decon Trailer	19	MO	$1,000	$19,000
Vehicle Decon Station	1	LS	$57,000	$57,000
Decontamination Personnel	19	MO	$38,000	$722,000
Disposal of Contaminated Materials	1327	DRUMS	$130	$172,529
Construction Administration Trailer	21	MO	$620	$13,020
Monitoring				
Background Air Monitoring	1	LS	$20,000	$20,000
Ambient Air Monitoring - 8 Monitors	19	MO	$25,600	$486,400
Sample/Analyze Debris for TCDD	50	EA	$300	$15,000
Sampling/Analysis to Guide Constructi	1500	EA	$300	$450,000
1 Included in RCRA CAP INSTALLATION				
			SUBTOTAL	$3,895,220
SITE PREPARATION AND CONSTRUCTION				
Site Access				
Fences and Gates	16430	LF	$12	$197,160
Access Roads	1	LS	$264,000	$264,000
Utility Connections and Water Supply	1	LS	$40,000	$40,000
Construction of Long-term Site Security Decontamination, & Storage Facilities	1	LS	$75,000	$75,000
Runoff Protection	19	MO	$24,700	$469,300
Remove Vegetation	46500	SY	$0.37	$17,205
Clear and Chip Obstructing Trees	14	AC	$4,950	$69,300
Bale and Store Chips and Brush	2076	CY	$52.50	$109,008
Generator Plant, Light Towers	21	MO	$5,400	$113,400
Install Groundwater Monitoring Wells	6	EA	$2,408	$14,448

				$1,368,821
SITE CONTAINMENT WORK				
Pulverize Existing Roads	161000	SY	$5.04	$811,440
Reconstruct Culverts	1	LS	$58,230	$58,230
Dust Control	194837	SY	$0.05	$9,742

				$879,412
RCRA CAP INSTALLATION				
Cap Materials				
Vegetated Top Layer				
Vegetation, Mulch, Hydroseed	12.0	AC	$1,100	$13,210
24 inch Soil Layer	38,750	CY	$3.10	$120,125
Installation	38,750	CY	$1.00	$38,750
Middle Drainage Layer				
Geotextile Fabric	58,125	SY	$3.10	$180,188
12 inches Drainage Gravel	19,375	CY	$10.50	$203,438
Gravel Placement	19,375	CY	$1.00	$19,375
Geotextile Fabric	58,125	SY	$3.10	$180,188
Low Permeability Bottom Layer				
60 mil Hypalon Synthetic Membrane	523,125	SF	$1.00	$523,125
Geotextile Fabric	58,125	SY	$3.10	$180,188
1 foot Bedding Layer	19,375	CY	$3.10	$60,063
Soil Placement	19,375	CY	$1.00	$19,375
Cap Installation (excl. earthwork)	523,125	SF	$1.20	$627,750
1987 Cost Adjustment	9%			$194,920

				$2,360,692
SOIL COVER OVER AREAS EXCEEDING 1 PPB				
12 inch Soil Layer	32,677	CY	$3.10	$101,298
Installation	32,677	CY	$1.00	$32,677
Vegetation, Mulch, Hydroseed	20.3	AC	$1,100	$22,280
1987 Cost Adjustment	9%			$14,063

				$170,317
				=============
INPLACE CONTAINMENT SUBTOTAL				$8,674,462

Bid Contingencies	15.0%	$1,301,169
Scope Contingencies	15.0%	$1,301,169
TOTAL CONSTRUCTION COST		$11,276,801
Permitting and Legal	3.0%	$338,304
Services During Construction	7.0%	$789,376
TOTAL IMPLEMENTATION COST		$12,404,481
Engineering Design Cost	6.0%	$744,269
TOTAL CAPITAL COST FOR ALTERNATIVE 1		$13,149,000

TIMES BEACH INPLACE CONTAINMENT LONG-TERM ANNUAL O & M COSTS

COST ITEM DESCRIPTION	FREQUENCY		YEARLY COST
OPERATION AND MAINTENANCE			
Clear Culverts	Annually		$1,995
Maintain Security Systems	Semiannually		$643
Mowing			$1,400
Reseed & Rework Eroded or Exposed Areas			$28,387
INSPECTION AND MONITORING			
Site Inspections	Monthly		$4,000
Groundwater Monitoring	Semiannually		$23,600
Site Runoff	Quarterly		$50,000
Perimeter Air Monitoring	Quarterly		$50,000
Security Patrols	Daily		$16,800
SUBTOTAL LONG-TERM ANNUAL O & M COST			$176,825
Administrative Costs		10 percent	$17,683
Contingency Costs		30 percent	$53,048
Insurance and Taxes		5 percent	$8,841
Maintenance Reserve			$28,387
TOTAL ANNUAL O & M COST FOR ALTERNATIVE 1			$284,800

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Table A-2
TIMES BEACH, MISSOURI
ONSITE LAND DISPOSAL
UNCONTAMINATED STRUCTURES AND DEBRIS

Sampling and Analysis	$358,000
Demolition	
Structure Demolition	$2,044,000
General Debris	$72,000
Decontamination Personnel	---
Baling Facility	---
General	$153,000
Site Preparation	$4,000
Baler Facility Construction	$290,000
Operation and Maintenance	$100,000
Decontamination Facility	---
Disposal	
Transport	$180,000
Placement	$60,000
Cover Construction	$935,000
Site Restoration	$294,000

Construction Subtotal	$4,490,000
Bid Contingencies (20%)	$898,000
Scope Contingencies (20%)	$898,000

Total Construction Cost	$6,286,000
Permitting and Legal (2%)	$126,000
Services During Construction (7%)	$440,000

TOTAL IMPLEMENTATION COST	$6,852,000
Engineering Design Cost (6%)	$411,000

TOTAL CAPITAL COST	$7,263,000

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Table A-3

CENTRALIZED THERMAL TREATMENT OF SOILS FROM DESIGNATED EASTERN MISSOURI SITES (EXCLUDING TIMES BEACH)

SITE NAME	SOIL VOLUME, (a)	EXCAVATION COST (b)	INCINERATION COST (c)	HAUL MILES	TRANSPORT COST (d)	NUMBER OF CLEANUP SECTIONS (e)	SAMPLING/ ANALYTICAL COST (f)	AIR MONITORING COST (g)	TOTAL SITE COST
RESIDENTIAL									
Stout Area	1,900	$0	$1,609,900	20	$76,000	18	$42,400	$10,100	$1,738,000
Romaine Creek	4,300	$0	$3,643,500	20	$361,200	36	$84,800	$22,900	$4,112,000
Lacy Manor	600	$252,000	$508,400	20	$50,400	6	$14,300	$3,200	$828,000
Bliss Ellisville	7,000	$2,940,000	$5,931,300	20	$588,000	71	$166,900	$37,300	$9,664,000
Comm. Christian Church	550	$231,000	$466,000	20	$46,200	6	$13,100	$2,900	$759,000
Manchester Meth. Church	300	$126,000	$254,200	20	$25,200	3	$7,200	$1,600	$414,000
Eureka-East North Street	750	$315,000	$635,500	20	$63,000	8	$17,900	$4,000	$1,035,000
Baxter Garden Center	1,500	$630,000	$1,271,000	20	$126,000	15	$35,800	$8,000	$2,071,000
subtotal	16,900	$4,494,000	$14,319,800		$1,336,000	171	$402,900	$90,100	$20,643,000
RESIDENTIAL/COMMERCIAL									
Highway 141 Access Road									
residential	520	$218,400	$440,600	20	$43,680	5	$12,400	$2,800	$718,000
commercial	100	$42,000	$84,700	20	$8,400	1	$2,400	$500	$138,000
Texas Motor Freight									
residential	700	$294,000	$593,100	20	$58,800	7	$16,700	$3,700	$966,000
commercial	300	$126,000	$254,200	20	$25,200	3	$7,200	$1,600	$414,000
subtotal	1,620	$680,400	$1,372,600		$136,080	16	$38,600	$8,600	$2,236,000
NON-RESIDENTIAL									
Bull Moose Tube	300	$126,000	$254,200	40	$50,400	3	$7,200	$1,600	$439,000
Hamill Transfer	1,800	$756,000	$1,525,200	20	$151,200	18	$42,900	$9,600	$2,485,000
Jones Truck Lines	1,000	$420,000	$847,300	20	$84,000	10	$23,800	$5,300	$1,380,000
Overnite Transport	---			20		---	---	---	---
Southern Cross Lumber	1,300	$546,000	$1,101,500	20	$109,200	13	$31,000	$6,900	$1,795,000
Times Beach	0	$0	$0		---	0	$0	$0	$0
Arkansas Best Freight	---			20		---	---	---	---
Bonifield Bros Trucking	2,100	$882,000	$1,779,400	20	$176,400	21	$50,100	$11,200	$2,899,000
subtotal	6,500	$2,730,000	$5,507,600		$571,200	66	$155,000	$34,600	$8,998,000

Table A-3 (cont.)

HORSE ARENAS SITES									
Timberline Stables	1,600	$672,000	$1,355,700	140	$940,800	16	$38,100	$8,500	$3,01
Bubbling Springs Arena	2,780	$1,167,600	$2,355,600	20	$233,520	28	$66,300	$14,800	$3,838,000
Saddle and Spur Arena	2,550	$1,071,000	$2,160,700	20	$214,200	26	$60,800	$13,600	$3,520,000
Shenandoah Stables	3,300	$1,386,000	$2,796,200	60	$831,600	33	$78,700	$17,600	$5,110,000
Piazza Road	7,800	$3,276,000	$6,609,200	70	$2,293,200	79	$186,000	$41,600	$12,406,000
Bliss Frontenac	750	$315,000	$635,500	20	$63,000	8	$17,900	$4,000	$1,035,000
subtotal	18,780	$7,887,600	$15,912,900		$4,576,320	190	$447,800	$100,100	$28,925,000
REMOVAL SITES (h)									
Castlewood	13,000	(included	$11,015,300	20	$520,000	---	---	---	$11,535,000
Minker, Minker Neighbors	4,400	in past	$3,728,200	20	$176,000	---	---	---	$3,904,000
Cashel Residence	1,000	costs)	$847,300	20	$40,000	---	---	---	$887,000
Sullins Residence	400		$338,900	20	$16,000	---	---	---	$355,000
Quail Run	16,000		$13,557,300	20	$640,000	---	---	---	$14,197,000
subtotal	34,800		$29,487,000		$1,392,000	---	---	---	$30,879,000
TOTAL	78,600	$15,792,000	$66,600,000		$8,012,000	443	$1,044,000	$233,000	$91,68

(a) Revised estimates reflect volume adjustments if contaminated areas which were not originally sprayed with contaminated waste oil (areas contaminated due to surface migration) require excavation to an average depth of 6 inches to achieve cleanup criteria. Sprayed areas are excavated to an average depth of one foot. Horse arenas excavated to an average depth of two feet, horse arena areas outside arena excavated to 1 foot, Shenandoah slough (100 x 100 ft) to 4 feet.

(b) Based on Missouri dioxin contract cost $420.00 per cubic yard. Romaine Creek and Stout excavation costs from Operable Unit Feasibility Studies.

(c) Offsite treatment cost is $847 per cubic yard.

(d) Transport cost assumed per cubic yard-mile is $2.10 per cubic yard-mile, except as noted.

(e) Based on average 4,000 square foot sections, except Stout (known) and Romaine Creek (3 10-foot wide sections along creek), plus 50% additional to verify perimeter clean.

(f) Costs represent actual sampling and analytical costs during eastern Missouri removal actions, assuming 8 total 50-aliquot samples per cleanup section at $294 per sample collection/analysis.

(g) Air monitoring costs assume $320 per sample, 5 monitors per site, 1 sample per 3 days per monitor, 100 cubic yards per day excavated. 10 monitors assumed for Piazza Road.

(h) Transport costs from Times Beach FS. Soil volumes represent actual volumes in storage.

Table A-4

NET THERMAL TREATMENT COSTS FOR DESIGNATED EASTERN MISSOURI SITES

(EXCLUDING TIMES BEACH SOILS)

THERMAL TREATMENT COSTS

ASSUMPTIONS

INCINERATION COST PER CUBIC YARD (CY) IS	$400
INCINERATOR CAPACITY (CY/HR) IS	4.25
TOTAL ONSITE SOIL VOLUME (CY) IS	0
OFFSITE CONTAINERIZED SOIL VOLUME IS	34,800
ADDITIONAL OFFSITE SOIL VOLUME (CY) IS	43,800
EFFICIENCY IS	70%

SUMMARY

NET TREATMENT COST IS	$42,700,000
TOTAL CAPITAL COST[1] IS	$66,600,000
TREATMENT TIME (MONTHS) IS	36.7
TOTAL CUBIC YARDS IS	78,600
NET TREATMENT COST PER CY IS	$543
TOTAL CAPITAL COST PER CY IS	$847
TOTAL ANNUAL O & M COST IS	

[1] includes contingencies, permitting and legal, and design costs

Table A-4 (cont.)

OFFSITE THERMAL TREATMENT FACILITY

COST ITEM DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
GENERAL				
Mobilization, Demobilization, Bonding, and Insurance	1	LS	8%	$714,768
Community Relations	85	MO	$6,000.00	$254,100
Full RCRA Part B Permit	1	LS	$500,000.00	$500,000
Security Guards and Trailer for Incin.	73	MO	$6,500.00	$472,500
Health and Safety Preparations				
Worker Physicals	100	EA	$600.00	$60,000
Worker Training	50	EA	$1,100.00	$55,000
Site Health and Safety				
Nurse and Safety Supervision	24	MO	$25,200.00	$604,800
Personal Protective Equipment/Incin.	1	LS	$258,750.00	$258,800
Decontamination				
Decon Trailer	24	MO	$1,000.00	$24,000
Vehicle Decon Station	1	LS	$57,000.00	$57,000
Decontamination Personnel	24	MO	$37,800.00	$907,200
Construction Trailer Rental	73	MO	$620.00	$45,100
Monitoring Activities				
Background Air Monitoring	1	LS	$43,700	$43,700
Ambient Air Monitoring - 4 Monitors	24	MO	$12,800	$307,200
Test for TCDD in Removed Vegetation	12	EA	$300	$3,600
			SUBTOTAL	$4,307,768
SITE PREPARATION AND CONSTRUCTION				
Site Access				
Fences and Gates	2100	LF	$14.00	$29,400
Road Improvements (onsite)	1	LS	$500,000	$500,000
Road Improvements (offsite)	1	LS	$500,000	$500,000
Utility Upgrading & Connections	1	LS	$40,000.00	$40,000
Fine Grading, Gravel Surfacing	24200	SY	$5.50	$133,100
Liquid Storage Facilities	1	LS	$500,000.00	$500,000
Building Floor Slabs				
Building Floor Slabs	39380	SF	$5.35	$210,700
Liquid Storage Slabs	30000	SF	$17.70	$531,000
Staging Area	117500	SF	5.35	
Ash Storage Area (2 week capacity)	20000	SF	5.35	$107,000
Buildings				
130 x 236 Incinerator Building	1	LS	$150,000.00	$150,000
60 x 145 Shredder Building	1	LS	$26,000.00	$26,000
130 x 236 Staging Building	1	LS	$150,000.00	$150,000
Utility Upgrading and Connections	1	LS	$92,000.00	$92,000
Outdoor Lighting	1	LS	$20,000.00	$20,000

Ditching for Site Runon, Pumping	1	LS	$41,900.00	$41,900
Floor Slab - Staging Area	117500	SF	$5.35	$628,600
130 x 236 Staging Bldg (3 wk capacity)	1	LS	$150,000	$150,000
			SUBTOTAL	$3,809,700
NCINERATOR SETUP AND OPERATION				
Startup/Shakedown	1	LS	$300,000.00	$300,000
Test Burn/Ash Delisting	1	LS	$700,000.00	$700,000
Load/Transport/Unload Onsite Soil	0	CY	$2.00	$0
Operation	78600	CY	$400.00	$31,440,000
Ash Removal, Fill Onsite, Compact	78600	CY	$20.00	$1,572,000
			SUBTOTAL	$34,012,000
INCINERATOR SITE RESTORATION				
Incinerator Demobilization	1	LS	$125,000.00	$125,000
Remove Buildings and Auxiliaries	1	LS	$50,000.00	$50,000
Remove 6 inches Gravel and Dispose	4500	CY	$19.00	$85,500
Regrade Site	24200	SY	$3.40	$82,300
Topsoil Placement (Offsite Borrow)	4500	CY	$13.50	$60,800
Erosion Matting	24200	SY	$0.80	$19,400
Seeding and Revegetation	24200	SY	$4.50	$108,900
			SUBTOTAL	$531,900
ONSITE THERMAL TREATMENT SUBTOTAL				$42,661,368
d Contingencies			20%	$8,532,300
Scope Contingencies			25%	$10,665,300
TOTAL CONSTRUCTION COST				$61,858,968
Permitting and Legal			3%	$865,400
Services During Construction			7%	$2,019,300
TOTAL IMPLEMENTATION COST				$64,743,668
Engineering Design Cost			6%	$1,903,900
TOTAL CAPITAL COST				$66,647,568

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Table A-5

ALTERNATIVE 2 - IMPERMEABLE BARRIER AND SOIL COVER OVER TIMES BEACH CONTAMINATED SOILS

SUMMARY TABLE

TIMES BEACH IN-PLACE CONTAINMENT COSTS

ASSUMPTIONS	
ACTION LEVEL IS	20 PPB
TOTAL AREA EXCEEDING ACTION LEVEL	46,500 SY
TOTAL AREA EXCEEDING 1 PPB	144,530 SY

SUMMARY	
NET DISPOSAL COST IS	$7,400,000
TOTAL CAPITAL COST** IS	$11,100,000
TOTAL ANNUAL O&M COST IS	$285,000
DURATION OF ONSITE ACTIVITIES IS	17 MO
DURATION OF CONSTRUCTION ACTIVITY IS	15 MO

**includes contingencies, permitting and legal, and design costs

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Table A-5 (cont.)

TIMES BEACH INPLACE CONTAINMENT CAPITAL COSTS

COST ITEM DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL
GENERAL				
Mobilization, Demobilization, Bonding, and Insurance	1	LS	8%	$410,703
Community Relations	19	MO	$6,000	$114,000
Security Guards and Trailer	19	MG	$6,500	$123,500
Health and Safety Preparations1				
Worker Physicals	100	EA	$600	$60,000
Worker Training	50	EA	$1,100	$55,000
Site Health and Safety1				
Nurse and Safety Supervision	15	MO	$37,800	$567,000
Personal Protective Equipment	1	LS	$364,500	$364,500
Decontamination				
Decon Trailer	15	MO	$1,000	$15,000
Vehicle Decon Station	1	LS	$57,000	$57,000
Decontamination Personnel	15	MO	$38,000	$570,000
Disposal of Contaminated Materials	1327	DRUMS	$130	$172,529
Construction Administration Trailer	15	MO	$620	$9,300
Monitoring				
Background Air Monitoring	1	LS	$20,000	$20,000
Ambient Air Monitoring - 8 Monitors	15	MO	$25,600	$384,000
Sample/Analyze Debris for TCDD	50	EA	$300	$15,000
Sampling/Analysis to Guide Constructi	1500	EA	$300	$450,000
			SUBTOTAL	$3,387,532
SITE PREPARATION AND CONSTRUCTION				
Site Access				
Fences and Gates	16430	LF	$12	$197,160
Access Roads	1	LS	$264,000	$264,000
Utility Connections and Water Supply	1	LS	$40,000	$40,000
Construction of Long-term Site Security Decontamination, & Storage Facilities	1	LS	$75,000	$75,000
Runoff Protection	15	MO	$24,700	$370,500
Remove Vegetation	46500	SY	$0.37	$17,205
Clear and Chip Obstructing Trees	14	AC	$4,950	$69,300
Bale and Store Chips and Brush	2631	CY	$52.50	$138,128
Generator Plant, Light Towers	17	MO	$5,400	$91,800
Install Groundwater Monitoring Wells	6	EA	$2,408	$14,448
				$1,277,541
SITE CONTAINMENT WORK				
Pulverize Existing Roads	161000	SY	$5.04	$811,440
Reconstruct Culverts	1	LS	$58,230	$58,230
Dust Control	194837	SY	$0.05	$9,742
				$879,412

COVER/MEMBRANE INSTALLATION

Cover Materials				
Vegetated Top Layer				
Vegetation, Mulch, Hydroseed	12.0	AC	$1,100	$13,210
12 inch Soil Layer	19,375	CY	$3.10	$60,063
Installation	19,375	CY	$1.00	$19,375
Impermeable Bottom Layer				
60 mil Hypalon Synthetic Membrane	523,125	SF	$1.00	$523,125
Geotextile Fabric	58,125	SY	$3.10	$180,188
1 foot Bedding Layer	19,375	CY	$3.10	$60,063
Soil Placement	19,375	CY	$1.00	$19,375
Cap Installation (excl. earthwork)	523,125	SF	$1.20	$627,750
1987 Cost Adjustment	9%			$135,283

				$1,638,431

SOIL COVER OVER AREAS EXCEEDING 1 PPB

12 inch Soil Layer	32,677	CY	$3.10	$101,298
Installation	32,677	CY	$1.00	$32,677
Vegetation, Mulch, Hydroseed	20.3	AC	$1,100	$22,280
1987 Cost Adjustment	9%			$14,063

				$170,317

INPLACE CONTAINMENT SUBTOTAL		$7,353,232
Bid Contingencies	15.0%	$1,102,[illegible]
Scope Contingencies	15.0%	$1,102,985

TOTAL CONSTRUCTION COST		$9,559,201
Permitting and Legal	3.0%	$286,776
Services During Construction	7.0%	$669,144

TOTAL IMPLEMENTATION COST		$10,515,121
Engineering Design Cost	6.0%	$630,907
		========
TOTAL CAPITAL COST FOR ALTERNATIVE 2		$11,146,000

TIMES BEACH INPLACE CONTAINMENT LONG-TERM ANNUAL O & M COSTS

COST ITEM DESCRIPTION	FREQUENCY	YEARLY COST
ATION AND MAINTENANCE		
Clear Culverts	Annually	$1,995
Maintain Security Systems	Semiannually	$643
Mowing		$1,400

Reseed & Rework Eroded or Exposed Areas			$28,387
INSPECTION AND MONITORING			
Site Inspections	Monthly		$4,000
Groundwater Monitoring	Semiannually		$23,600
Site Runoff	Quarterly		$50,000
Perimeter Air Monitoring	Quarterly		$50,000
Security Patrols	Daily		$16,800

SUBTOTAL LONG-TERM ANNUAL O & M COST			$176,825
Administrative Costs		10 percent	$17,683
Contingency Costs		30 percent	$53,048
Insurance and Taxes		5 percent	$8,841
Maintenance Reserve			$28,387
			===============
TOTAL ANNUAL O & M COST FOR ALTERNATIVE 2			$284,800

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Table A-6

ALTERNATIVE 3 - ONSITE LAND DISPOSAL OF TIMES BEACH CONTAMINATED SOILS

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TIMES BEACH ONSITE LAND DISPOSAL FACILITY COSTS


                         ASSUMPTIONS
                         -----------
         TIMES BEACH ACTION LEVEL IS           20 PPB
          TIMES BEACH SOIL VOLUME IS       13,600 CUBIC YARDS


                             SUMMARY
                             -------
              TOTAL CLEARED AREA IS         5,000 SQUARE YARDS
              FACILITY BASE AREA IS         3,000 SQUARE YARDS
  SOIL PLACEMENT PERIOD IS PERIOD IS            5 MONTHS
       TOTAL CONSTRUCTION PERIOD IS            18 MONTHS


            TOTAL DISPOSAL COST** IS  $8,200,000
                 EXCAVATION COST IS  $5,712,000
             AIR MONITORING COST IS    $165,385
        SAMPLING/ANALYTICAL COST IS    $369,556
                                     -------------
              TOTAL CAPITAL COST IS $14,446,941


           TOTAL ANNUAL O&M COST IS    $158,000

**includes contingencies, permitting and legal, and design costs
```

ONSITE LAND DISPOSAL CAPITAL COSTS

****

GENERAL				
Mobilization, Demobilization, Bonding, and Insurance	1	LS	8.00%	$358,528
Community Relations	29	MO	$6,000	$174,000
RCRA Part B Permit	0	LS	$500,000	$0
Security Guards and Trailer	18	MO	$6,500	$117,000
Construction Trailer Rental	18	MO	$620.00	$11,200
Health & Safety				
Worker Physicals	50	EA	$600	$30,000
Worker Training	25	EA	$1,100	$27,500
Site Health & Safety				
Nurse & Safety Supervision	10	MO	$37,800	$378,000
Personal Protective Equipment	1	LS	$45,400	$45,400
Decontamination				
Decon Trailer	10	MO	$1,000	$10,000
Vehicle Decon Station	1	LS	$57,000	$57,000
Decontamination Personnel	10	MO	$37,800	$378,000
Monitoring Activities				
Background Air Monitoring	1	LS	$43,700	$43,700
Air Monitoring	10	MO	$12,800	$128,000
Test for TCDD in Removed Vegetation	2	EA	$300	$600
Monthly Leachate Samples	10	MO	$9,600	$96,000

				$1,854,928
SITE PREPARATION AND CONSTRUCTION				
Site Access				
Fences & Gates	300	LF	$14	$4,200
New Roads and Road Improvements	1	LS	$500,000	$500,000
Offsite Road Upgrading	1	LS	$500,000	$500,000
Utility Upgrading & Connections	1	LS	$40,000	$40,000
Install Groundwater & Monitoring Wells	6	EA	$2,488	$14,900
Clear Brush & Debris, Remove to Storage	5,000	SY	$1	$5,000
Regrade, Compact	5,000	SY	$2.38	$11,900
Outdoor Lighting	1	LS	$20,000	$20,000
Ditching for Site Runon	300	LF	$0.56	$200

				$1,096,200
ONSITE DISPOSAL FACILITY				
Base				
Base Preparation and Underdrain	3000	SY	$9.68	$29,000
Base Concrete and Liner	3000	SY	$69.00	$207,000
Leachate Collection Layer	3000	SY	$7.69	$23,100
Leak Detection Layer	3000	SY	$14.45	$43,400
Sidewalls	500	SY	$158	$79,000
Cover	3000	SY	$35	$105,000
Sidewall Backfill Layer	1	LS	$89,400	$89,400
Collection Systems	1	LS	$59,500	$59,500
Placement of Waste				
Bulldozers (2), Sheepsfoot Roller	13600	CY	$4	$54,400
Physical Soils Lab Trailer	5	MO	$5,000	$25,000
Lab Technicians (2), Surveyors (2)	5	MO	$30,100	$150,500

Leachate Treatment Facility				
Sumps, Piping, Trenches	1	LS	$129,855	$129,900
Site Preparation	1	LS	$28,149	$28,100
Foundation, Building, & Ancillaries	1	LS	$141,966	$142,000
Installed Treatment System	1	LS	$517,704	$517,700
Land Application System	1	LS	$15,000	$15,000
Operating Materials and Power	10	MO	$5,000	$50,000
Operating Labor	10	MO	$14,100	$141,000
				$1,889,000
ONSITE DISPOSAL SUBTOTAL				$4,840,000
Bid Contingencies			20.0%	$968,000
Scope Contingencies			25.0%	$1,210,000
TOTAL CONSTRUCTION COST				$7,018,000
Permitting and Legal			3.0%	$210,500
Services During Construction			7.0%	$491,300
TOTAL IMPLEMENTATION COST				$7,719,800
Engineering Design Cost			6.0%	$463,200
TOTAL CAPITAL COST				$8,183,000

ONSITE LAND DISPOSAL LONG-TERM ANNUAL O & M COSTS (ALT. 3)

COST ITEM DESCRIPTION	FREQUENCY		YEARLY COST
OPERATION AND MAINTENANCE			
Cover Regrading/Reworking	Annually		$15,000
Security System Maintenance	Semiannually		$1,500
Leachate Collection & Leak Detection Main	Periodic		$14,800
Leachate Treatment Plant O & M	Periodic		$7,500
Maintain Runon/Runoff Control Systems	Semiannually		$2,300
INSPECTIONS AND MONITORING			
Site Inspections	Monthly		$18,000
Groundwater Monitoring	Semiannually		$23,600
Leachate and Leak Monitoring	Periodic		$9,600
Security Patrols	Daily		$16,800
SUBTOTAL LONG-TERM ANNUAL O & M			$109,100
Administrative Costs	10	percent	$10,900
Contingency Costs	30	percent	$32,700
Insurance and Taxes	5	percent	$5,500
			$49,100
TOTAL			$158,200

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Table A-7
NET TIMES BEACH THERMAL TREATMENT COSTS
TIMES BEACH AND M/S/RC SOILS ONLY

THERMAL TREATMENT COSTS

ASSUMPTIONS

INCINERATION COST PER CUBIC YARD (CY) IS	$400
INCINERATOR CAPACITY (CY/HR) IS	4.25
TOTAL ONSITE SOIL VOLUME (CY) IS	13,600
OFFSITE CONTAINERIZED SOIL VOLUME IS	12,000
ADDITIONAL OFFSITE SOIL VOLUME (CY) IS	0
EFFICIENCY IS	70%

SUMMARY

NET TREATMENT COST IS	$21,500,000
TOTAL CAPITAL COST[1] IS	$34,600,000
TREATMENT TIME (MONTHS) IS	12.0
TOTAL CUBIC YARDS IS	25,600
NET TREATMENT COST PER CY IS	$840
TOTAL CAPITAL COST PER CY IS	$1,352
TOTAL ANNUAL O & M COST IS	$25,200

[1] includes contingencies, permitting and legal, and design costs

Table A-7 (cont.)
TIMES BEACH
ONSITE THERMAL TREATMENT FACILITY
TIMES BEACH SOILS

GENERAL				
Mobilization, Demobilization, Bonding, and Insurance	1	LS	8%	$799,068
Community Relations	48	MO	$6,000.00	$143,850
Full RCRA Part B Permit	1	LS	$500,000.00	$500,000
Security Guards and Trailer for Incin.	36	MO	$6,500.00	$233,700
Health and Safety Preparations				
Worker Physicals	100	EA	$600.00	$60,000
Worker Training	50	EA	$1,100.00	$55,000
Site Health and Safety				
Nurse and Safety Supervision	12	MO	$25,200.00	$301,200
Personal Protective Equipment/Incin.	1	LS	$258,750.00	$258,800
Decontamination				
Decon Trailer	12	MO	$1,000.00	$12,000
Vehicle Decon Station	1	LS	$57,000.00	$57,000
Decontamination Personnel	12	MO	$37,800.00	$451,800
Construction Trailer Rental	36	MO	$620.00	$22,300
Monitoring Activities				
Background Air Monitoring	1	LS	$43,700	$43,700
Ambient Air Monitoring - 4 Monitors	24	MO	$12,800	$307,200
Test for TCDD in Removed Vegetation	4	EA	$300	$1,200
			SUBTOTAL	$3,246,818
SITE PREPARATION AND CONSTRUCTION				
Site Access				
Fences and Gates	2100	LF	$14.00	$29,400
Road Improvements (onsite)	1	LS	$500,000	$500,000
Road Improvements (offsite)	1	LS	$500,000	$500,000
Utility Upgrading & Connections	1	LS	$40,000.00	$40,000
Ring Levee - 5 acres protected (Corps)	1	LS	$2,200,000	$2,200,000
Fine Grading, Gravel Surfacing	24200	SY	$5.50	$133,100
Liquid Storage Facilities	1	LS	$500,000.00	$500,000
Building Floor Slabs				
Building Floor Slabs	39380	SF	$5.35	$210,700
Liquid Storage Slabs	30000	SF	$17.70	$531,000
Staging Area	117500	SF	5.35	
Ash Storage Area (2 week capacity)	20000	SF	5.35	$107,000
Buildings				
130 x 236 Incinerator Building	1	LS	$150,000.00	$150,000
60 x 145 Shredder Building	1	LS	$26,000.00	$26,000
130 x 236 Staging Building	1	LS	$150,000.00	$150,000
Utility Upgrading and Connections	1	LS	$92,000.00	$92,000
Outdoor Lighting	1	LS	$20,000.00	$20,000
Ditching for Site Runon, Pumping	1	LS	$13,700.00	$13,700
Floor Slab - Staging Area	117500	SF	$5.35	$628,600
130 x 236 Staging Bldg (3 wk capacity)	1	LS	$150,000	$150,000
			SUBTOTAL	$5,981,500
INCINERATOR SETUP AND OPERATION				
Startup/Shakedown	1	LS	$300,000.00	$300,000
Test Burn/Ash Delisting	1	LS	$700,000.00	$700,000
Load/Transport/Unload Onsite Soil	13600	CY	$2.00	$27,200
Operation	25600	CY	$400.00	$10,240,000

Ash Removal, Fill Onsite, Compact	25600	CY	$20.00	$512,000

			SUBTOTAL	$11,779,200
INCINERATOR SITE RESTORATION				
Incinerator Demobilization	1	LS	$125,000.00	$125,000
Remove Buildings and Auxiliaries	1	LS	$50,000.00	$50,000
Remove 6 inches Gravel and Dispose	4500	CY	$19.00	$85,500
Regrade Site	24200	SY	$3.40	$82,300
Topsoil Placement (Offsite Borrow)	4500	CY	$13.50	$60,800
Erosion Matting	24200	SY	$0.80	$19,400
Seeding and Revegetation	24200	SY	$4.50	$108,900

			SUBTOTAL	$531,900
				===============
ONSITE THERMAL TREATMENT SUBTOTAL				$21,539,418
Bid Contingencies			20%	$4,307,900
Scope Contingencies			25%	$5,384,900

TOTAL CONSTRUCTION COST				$31,232,218
Permitting and Legal			3%	$614,400
Services During Construction			7%	$1,433,600

TOTAL IMPLEMENTATION COST				$33,280,218
Engineering Design Cost			6%	$1,351,700
				==========
TOTAL CAPITAL COST				$34,631,918

LONG TERM O&M COSTS

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Site Inspections	Monthly		$18,000
Administrative Costs	10 percent		$1,800
Contingency Costs	30 percent		$5,400
			===============
		TOTAL	$25,200

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Table A-8
THERMAL TREATMENT COST ANALYSIS

ALTERNATIVE 4: CENTRALIZED THERMAL TREATMENT OF SOILS FROM TIMES BEACH AND DESIGNATED EASTERN MISSOURI SITES

THERMAL TREATMENT COSTS

ASSUMPTIONS

INCINERATION COST PER CUBIC YARD (CY) IS	$400
INCINERATOR CAPACITY (CY/HR) IS	4.25
TOTAL ONSITE SOIL VOLUME (CY) IS	13,600
OFFSITE CONTAINERIZED SOIL VOLUME IS	34,800
ADDITIONAL OFFSITE SOIL VOLUME (CY) IS	43,800
EFFICIENCY IS	70%

SUMMARY

NET THERMAL TREATMENT COST IS	$51,500,000
TOTAL CAPITAL THERMAL TREATMENT COST[1] IS	$80,700,000
TREATMENT TIME (MONTHS) IS	43.0
TOTAL CUBIC YARDS IS	92,200
ONSITE TREATMENT COST PER CUBIC YARD IS	$1,352
OFFSITE TREATMENT COST PER CUBIC YARD IS	$692
TOTAL ANNUAL O & M COST IS	$25,200

[1] includes contingencies, permitting and legal, and design costs

Table A-8 (cont.)
TIMES BEACH
ONSITE THERMAL TREATMENT FACILITY
EASTERN MISSOURI SOILS

GENERAL				
Mobilization, Demobilization, Bonding, and Insurance	1	LS	8%	$948,116
Community Relations	79	MO	$6,000.00	$237,150
Full RCRA Part B Permit	1	LS	$500,000.00	$500,000
Security Guards and Trailer for Incin.	67	MO	$6,500.00	$435,800
Health and Safety Preparations				
Worker Physicals	100	EA	$600.00	$60,000
Worker Training	50	EA	$1,100.00	$55,000
Site Health and Safety				
Nurse and Safety Supervision	24	MO	$25,200.00	$604,800
Personal Protective Equipment/Incin.	1	LS	$258,750.00	$258,800
Decontamination				
Decon Trailer	43	MO	$1,000.00	$43,000
Vehicle Decon Station	1	LS	$57,000.00	$57,000
Decontamination Personnel	43	MO	$37,800.00	$1,627,100
Construction Trailer Rental	67	MO	$620.00	$41,600
Monitoring Activities				
Background Air Monitoring	1	LS	$43,700	$43,700
Ambient Air Monitoring - 4 Monitors	24	MO	$12,800	$307,200
Test for TCDD in Removed Vegetation	14	EA	$300	$4,200
			SUBTOTAL	$5,223,466
SITE PREPARATION AND CONSTRUCTION				
Site Access				
Fences and Gates	2100	LF	$14.00	$29,400
Road Improvements (onsite)	1	LS	$500,000	$500,000
Road Improvements (offsite)	1	LS	$500,000	$500,000
Utility Upgrading & Connections	1	LS	$40,000.00	$40,000
Ring Levee - 5 acres protected (Corps)	1	LS	$2,200,000	$2,200,000
Fine Grading, Gravel Surfacing	24200	SY	$5.50	$133,100
Liquid Storage Facilities	1	LS	$500,000.00	$500,000
Building Floor Slabs				
Building Floor Slabs	39380	SF	$5.35	$210,700
Liquid Storage Slabs	30000	SF	$17.70	$531,000
Staging Area	117500	SF	5.35	
Ash Storage Area (2 week capacity)	20000	SF	5.35	$107,000
Buildings				
130 x 236 Incinerator Building	1	LS	$150,000.00	$150,000
60 x 145 Shredder Building	1	LS	$26,000.00	$26,000
130 x 236 Staging Building	1	LS	$150,000.00	$150,000
Utility Upgrading and Connections	1	LS	$92,000.00	$92,000
Outdoor Lighting	1	LS	$20,000.00	$20,000
Ditching for Site Runon, Pumping	1	LS	$49,200.00	$49,200
Floor Slab - Staging Area	117500	SF	$5.35	$628,600
130 x 236 Staging Bldg (3 wk capacity)	1	LS	$150,000	$150,000
			SUBTOTAL	$6,017,000
INCINERATOR SETUP AND OPERATION				
Startup/Shakedown	1	LS	$300,000.00	$300,000
Test Burn/Ash Delisting	1	LS	$700,000.00	$700,000
Load/Transport/Unload Onsite Soil	13600	CY	$2.00	$27,200
Operation	92200	CY	$400.00	$36,880,000

Ash Removal, Fill Onsite, Compact	92200	CY	$20.00	$1,844,000
			SUBTOTAL	$39,751,200
INCINERATOR SITE RESTORATION				
Incinerator Demobilization	1	LS	$125,000.00	$125,000
Remove Buildings and Auxiliaries	1	LS	$50,000.00	$50,000
Remove 6 inches Gravel and Dispose	4500	CY	$19.00	$85,500
Regrade Site	24200	SY	$3.40	$82,300
Topsoil Placement (Offsite Borrow)	4500	CY	$13.50	$60,800
Erosion Matting	24200	SY	$0.80	$19,400
Seeding and Revegetation	24200	SY	$4.50	$108,900
			SUBTOTAL	$531,900

ONSITE THERMAL TREATMENT SUBTOTAL		$51,523,566
Bid Contingencies	20%	$10,304,700
Scope Contingencies	25%	$12,880,900
TOTAL CONSTRUCTION COST		$74,709,166
Permitting and Legal	3%	$1,079,600
Services During Construction	7%	$2,519,000
TOTAL IMPLEMENTATION COST		$78,307,766
Engineering Design Cost	6%	$2,375,000
TOTAL CAPITAL COST		$80,682,766

LONG TERM O&M COSTS FOR ALTERNATIVE 4

Site Inspections	Monthly	$18,000
Administrative Costs	10 percent	$1,800
Contingency Costs	30 percent	$5,400
	TOTAL	$25,200

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Table A-9

ALTERNATIVE 4: CENTRALIZED THERMAL TREATMENT OF SOILS FROM TIMES BEACH AND DESIGNATED EASTERN MISSOURI SITES

SITE NAME	SOIL VOLUME, (a)	EXCAVATION COST (b)	INCINERATION COST (c)	HAUL MILES	TRANSPORT COST (d)	NUMBER OF CLEANUP SECTIONS (e)	SAMPLING/ ANALYTICAL COST (f)	AIR MONITORING COST (g)	TOTAL SITE COST
RESIDENTIAL									
Stout Area	1,900	$0	$2,568,000	19	$72,200	18	$42,400	$10,100	$2,693,000
Romaine Creek	4,300	$0	$5,811,700	19	$343,140	36	$84,800	$22,900	$6,263,000
Lacy Manor	600	$252,000	$415,300	26	$65,520	6	$14,300	$3,200	$750,000
Bliss Ellisville	7,000	$2,940,000	$4,845,300	10	$294,000	71	$166,900	$37,300	$8,284,000
Comm. Christian Church	550	$231,000	$380,700	9	$20,790	6	$13,100	$2,900	$648,000
Manchester Meth. Church	300	$126,000	$207,700	9	$11,340	3	$7,200	$1,600	$354,000
Eureka-East North Street	750	$315,000	$519,100	4	$12,600	8	$17,900	$4,000	$869,000
Baxter Garden Center	1,500	$630,000	$1,038,300	15	$94,500	15	$35,800	$3,000	$1,807,000
subtotal	16,900	$4,494,000	$15,786,100		$914,090	171	$402,900	$90,100	$21,687,000
RESIDENTIAL/COMMERCIAL									
Highway 141 Access Road									
residential	520	$218,400	$359,900	13	$28,392	5	$12,400	$2,800	$622,000
mercial	100	$42,000	$69,200	13	$5,460	1	$2,400	$500	$120,000
East .exas Motor Freight									
residential	700	$294,000	$484,500	26	$76,440	7	$16,700	$3,700	$875,000
commercial	300	$126,000	$207,700	26	$32,760	3	$7,200	$1,600	$375,000
subtotal	1,620	$680,400	$1,121,300		$143,052	16	$38,600	$8,600	$1,992,000
NON-RESIDENTIAL									
Bull Moose Tube	300	$126,000	$207,700	44	$55,440	3	$7,200	$1,600	$398,000
Hamill Transfer	1,800	$756,000	$1,245,900	22	$166,320	18	$42,900	$9,600	$2,221,000
Jones Truck Lines	1,000	$420,000	$692,200	27	$113,400	10	$23,800	$5,300	$1,255,000
Overnite Transport	---			28		---	---	---	---
Southern Cross Lumber	1,300	$546,000	$899,800	25	$136,500	13	$31,000	$6,900	$1,620,000
Times Beach (h)	13,600	$5,712,000	$18,381,300	0	---	138	$324,300	$145,100	$24,563,000
Arkansas Best Freight	---			29		---	---	---	---
Bonifield Bros Trucking	2,100	$882,000	$1,453,600	22	$194,040	21	$50,100	$11,200	$2,591,000
subtotal	20,100	$8,442,000	$22,880,500		$665,700	204	$479,200	$107,100	$32,575,000

Table A-9 (cont.)

HORSE ARENAS SITES									
Timberline Stables	1,600	$672,000	$1,107,500	131	$880,320	16	$38,100	$8,500	$2,706,000
Bubbling Springs Arena	2,780	$1,167,600	$1,924,300	15	$175,140	28	$66,300	$14,800	$3,348,000
Saddle and Spur Arena	2,550	$1,071,000	$1,765,100	4	$42,840	26	$60,800	$13,600	$2,953,000
Shenandoah Stables	3,300	$1,386,000	$2,284,200	61	$845,460	33	$78,700	$17,600	$4,612,000
Piazza Road	7,800	$3,276,000	$5,399,100	68	$2,227,680	79	$186,000	$41,600	$11,130,000
Bliss Frontenac	750	$315,000	$519,100	19	$59,850	8	$17,900	$4,000	$916,000
subtotal	18,780	$7,887,600	$12,999,300		$4,231,290	190	$447,800	$100,100	$25,666,000
REMOVAL SITES (i)									
Castlewood	13,000	(included in past costs)	$8,998,500	14	$364,000	---	---	---	$9,363,000
Minker, Minker Neighbors	4,400		$5,946,900	19	$167,200	---	---	---	$6,114,000
Cashel Residence	1,000		$1,351,600	19	$38,000	---	---	---	$1,390,000
Sullins Residence	400		$540,600	19	$15,200	---	---	---	$556,000
Quail Run	16,000		$11,075,100	15	$480,000	---	---	---	$11,555,000
subtotal	34,800		$27,912,700		$1,064,400	---	---	---	$28,977,000
TOTAL	92,200	$21,504,000	$80,700,000		$7,019,000	581	$1,369,000	$306,000	$110,898,000

(a) Revised estimates reflect volume adjustments if contaminated areas which were not originally sprayed with contaminated waste oil (areas contaminated due to surface migration) require excavation to an average depth of 6 inches to achieve cleanup criteria. Sprayed areas are excavated to an average depth of one foot. Horse arenas excavated to an average depth of two feet, horse arena areas outside arena excavated to 1 foot, Shenandoah slough (100 x 100 ft) to 4 feet.

(b) Based on Missouri dioxin contract cost $420.00 per cubic yard.
Romaine Creek and Stout excavation costs from Operable Unit Feasibility Studies.

(c) Offsite treatment cost is $692 per cubic yard; Onsite cost is $1,352 per cubic yard.

(d) Transport cost assumed per cubic yard-mile is $2.10 per cubic yard-mile, except as noted.

(e) Based on average 4,000 square foot sections, except Stout (known) and Romaine Creek (3 10-foot wide sections along creek), plus 50% additional to verify perimeter clean.

(f) Costs represent actual sampling and analytical costs during eastern Missouri removal actions, assuming 8 total 50-aliquot samples per cleanup section at $294 per sample collection/analysis.

(g) Air monitoring costs assume $320 per sample, 5 monitors per site, 1 sample per 3 days per monitor, 100 cubic yards per day excavated. 10 monitors assumed for Times Beach and Piazza Road.

(h) Excavation cost includes onsite land disposal of structures and debris ($6,836,000) from Times Beach FS.

(i) Transport costs from Times Beach FS. Soil volumes actual for all except Castlewood (estimated).

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Table A-10
ONSITE LAND DISPOSAL OF CONTAMINATED SOILS FROM TIMES BEACH ONLY

TIMES BEACH ONSITE LAND DISPOSAL FACILITY COSTS

ASSUMPTIONS

TIMES BEACH ACTION LEVEL IS	20 PPB
TIMES BEACH SOIL VOLUME IS	13,600 CUBIC YARDS
OFFSITE SOIL VOLUME IS	0 CUBIC YARDS
TOTAL SOIL VOLUME IS	13,600 CUBIC YARDS

SUMMARY

TOTAL CLEARED AREA IS	5,000 SQUARE YARDS
FACILITY BASE AREA IS	3,000 SQUARE YARDS
SOIL PLACEMENT PERIOD IS PERIOD IS	1 MONTHS
TOTAL CONSTRUCTION PERIOD IS	14 MONTHS
NET DISPOSAL COST IS	$4,600,000
TOTAL CAPITAL COST** IS	$7,800,000
TOTAL ANNUAL O&M COST IS	$49,000
NET DISPOSAL COST PER CY IS	$338
TOTAL CAPITAL COST PER CY IS	$574

**includes contingencies, permitting and legal, and design costs

Table A-10 (cont.)

ONSITE LAND DISPOSAL CAPITAL COSTS

****

GENERAL				
Mobilization, Demobilization, Bonding, and Insurance	1	LS	8.00%	$341,960
Community Relations	25	MO	$6,000	$150,000
RCRA Part B Permit	1	LS	$500,000	$500,000
Security Guards and Trailer	14	MO	$6,500	$91,000
Construction Trailer Rental	14	MO	$620.00	$8,700
Health & Safety				
Worker Physicals	14	EA	$600	$8,200
Worker Training	7	EA	$1,100	$7,500
Site Health & Safety				
Nurse & Safety Supervision	6	MO	$37,800	$226,800
Personal Protective Equipment	1	LS	$45,400	$45,400
Decontamination				
Decon Trailer	6	MO	$1,000	$6,000
Vehicle Decon Station	1	LS	$57,000	$57,000
Decontamination Personnel	6	MO	$37,800	$226,800
Monitoring Activities				
Background Air Monitoring	1	LS	$43,700	$43,700
Air Monitoring	6	MO	$12,800	$76,800
Test for TCDD in Removed Vegetation	2	EA	$300	$600
Monthly Leachate Samples	6	MO	$9,600	$57,600

				$1,848,060
SITE PREPARATION AND CONSTRUCTION				
Site Access				
Fences & Gates	300	LF	$14	$4,200
New Roads and Road Improvements	1	LS	$500,000	$500,000
Offsite Road Upgrading	1	LS	$500,000	$500,000
Utility Upgrading & Connections	1	LS	$40,000	$40,000
Install Groundwater & Monitoring Wells	6	EA	$2,488	$14,900
Clear Brush & Debris, Remove to Storage	5,000	SY	$1	$5,000
Regrade, Compact	5,000	SY	$2.38	$11,900
Outdoor Lighting	1	LS	$20,000	$20,000
Ditching for Site Runon	300	LF	$0.56	$200

				$1,096,200
ONSITE DISPOSAL FACILITY				
Base				
Base Preparation and Underdrain	3000	SY	$9.68	$29,000
Base Concrete and Liner	3000	SY	$69.00	$207,000
Leachate Collection Layer	3000	SY	$7.69	$23,100
Leak Detection Layer	3000	SY	$14.45	$43,400
Sidewalls	500	SY	$158	$79,000
Cover	3000	SY	$35	$105,000
Sidewall Backfill Layer	1	LS	$89,400	$89,400
Collection Systems	1	LS	$59,500	$59,500
Placement of Waste				
Bulldozers (2), Sheepsfoot Roller	13600	CY	$4	$54,400
Physical Soils Lab Trailer	1	MO	$5,000	$5,000
Lab Technicians (2), Surveyors (2)	1	MO	$30,100	$30,100

Leachate Treatment Facility				
Sumps, Piping, Trenches	1	LS	$129,855	$129,900
Site Preparation	1	LS	$28,149	$28,100
Foundation, Building, & Ancillaries	1	LS	$141,966	$142,000
Installed Treatment System	1	LS	$517,704	$517,700
Land Application System	1	LS	$15,000	$15,000
Operating Materials and Power	6	MO	$5,000	$30,000
Operating Labor	6	MO	$14,100	$84,600
				$1,672,200
ONSITE DISPOSAL SUBTOTAL				$4,616,000
Bid Contingencies			20.0%	$923,200
Scope Contingencies			25.0%	$1,154,000
TOTAL CONSTRUCTION COST				$6,693,200
Permitting and Legal			3.0%	$200,800
Services During Construction			7.0%	$468,500
TOTAL IMPLEMENTATION COST				$7,362,500
Engineering Design Cost			6.0%	$441,800
TOTAL CAPITAL COST				$7,804,000

TIMES BEACH ONSITE LAND DISPOSAL LONG-TERM ANNUAL O & M COSTS

COST ITEM DESCRIPTION	FREQUENCY	YEARLY COST
OPERATION AND MAINTENANCE		
Cover Regrading/Reworking	Annually	$15,000
Security System Maintenance	Semiannually	$1,500
Leachate Collection & Leak Detection Main	Periodic	$14,800
Leachate Treatment Plant O & M	Periodic	$7,500
Maintain Runon/Runoff Control Systems	Semiannually	$2,300
INSPECTIONS AND MONITORING		
Site Inspections	Monthly	$18,000
Groundwater Monitoring	Semiannually	$23,600
Leachate and Leak Monitoring	Periodic	$9,600
Security Patrols	Daily	$16,800
SUBTOTAL LONG-TERM ANNUAL O & M		$109,100
Administrative Costs	10 percent	$10,900
Contingency Costs	30 percent	$32,700
Insurance and Taxes	5 percent	$5,500
		$49,100
TOTAL ANNUAL O & M COST FOR ONSITE DISPOSAL FACILITY		$158,200

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Table A-11
ALTERNATIVE 5 - ONSITE LAND DISPOSAL OF CONTAMINATED SOILS FROM TIMES BEACH AND DESIGNATED EASTERN MISSOURI SITES

TIMES BEACH ONSITE LAND DISPOSAL FACILITY COSTS

ASSUMPTIONS

TIMES BEACH ACTION LEVEL IS	20 PPB
TIMES BEACH SOIL VOLUME IS	13,600 CUBIC YARDS
OFFSITE SOIL VOLUME IS	78,600 CUBIC YARDS
TOTAL SOIL VOLUME IS	92,200 CUBIC YARDS

SUMMARY

TOTAL CLEARED AREA IS	36,000 SQUARE YARDS
FACILITY BASE AREA IS	19,000 SQUARE YARDS
SOIL PLACEMENT PERIOD IS PERIOD IS	9 MONTHS
TOTAL CONSTRUCTION PERIOD IS	22 MONTHS
NET DISPOSAL COST IS	$11,500,000
TOTAL CAPITAL COST** IS	$19,500,000
TOTAL ANNUAL O&M COST IS	$53,000
ONSITE CAPITAL COST PER CY IS	$574
OFFSITE CAPITAL COST PER CY IS	$149

**includes contingencies, permitting and legal, and design costs

Table A-11 (cont.)

ONSITE LAND DISPOSAL CAPITAL COSTS
****

GENERAL				
Mobilization, Demobilization, Bonding, and Insurance	1	LS	8.00%	$853,504
Community Relations	33	MO	$6,000	$198,000
RCRA Part B Permit	1	LS	$500,000	$500,000
Security Guards and Trailer	22	MO	$6,500	$143,000
Construction Trailer Rental	22	MO	$620.00	$13,600
Health & Safety				
Worker Physicals	92	EA	$600	$55,300
Worker Training	46	EA	$1,100	$50,700
Site Health & Safety				
Nurse & Safety Supervision	14	MO	$37,800	$529,200
Personal Protective Equipment	1	LS	$308,100	$308,100
Decontamination				
Decon Trailer	14	MO	$1,000	$14,000
Vehicle Decon Station	1	LS	$57,000	$57,000
Decontamination Personnel	14	MO	$37,800	$529,200
Monitoring Activities				
Background Air Monitoring	1	LS	$43,700	$43,700
Air Monitoring	14	MO	$12,800	$179,200
Test for TCDD in Removed Vegetation	14	EA	$300	$4,200
Monthly Leachate Samples	14	MO	$9,600	$134,400

				$3,613,104
SITE PREPARATION AND CONSTRUCTION				
Site Access				
Fences & Gates	2100	LF	$14	$29,400
New Roads and Road Improvements	1	LS	$500,000	$500,000
Offsite Road Upgrading	1	LS	$500,000	$500,000
Utility Upgrading & Connections	1	LS	$40,000	$40,000
Install Groundwater & Monitoring Wells	6	EA	$2,488	$14,900
Clear Brush & Debris, Remove to Storage	36,000	SY	$1	$36,000
Regrade, Compact	36,000	SY	$2.38	$85,700
Outdoor Lighting	1	LS	$20,000	$20,000
Ditching for Site Runon	2100	LF	$0.56	$1,200

				$1,227,200
ONSITE DISPOSAL FACILITY				
Base				
Base Preparation and Underdrain	19000	SY	$9.68	$183,900
Base Concrete and Liner	19000	SY	$69.00	$1,311,000
Leachate Collection Layer	19000	SY	$7.69	$146,100
Leak Detection Layer	19000	SY	$14.45	$274,600
Sidewalls	3100	SY	$158	$489,800
Cover	19000	SY	$35	$665,000
Sidewall Backfill Layer	1	LS	$606,100	$606,100
Collection Systems	1	LS	$403,100	$403,100
Placement of Waste				
Bulldozers (2), Sheepsfoot Roller	92200	CY	$4	$368,800
Physical Soils Lab Trailer	9	MO	$5,000	$45,000
Lab Technicians (2), Surveyors (2)	9	MO	$30,100	$270,900

Leachate Treatment Facility				
Sumps, Piping, Trenches	1	LS	$259,710	$259,700
Site Preparation	1	LS	$56,298	$56,300
Foundation, Building, & Ancillaries	1	LS	$283,932	$283,900
Installed Treatment System	1	LS	$1,035,408	$1,035,400
Land Application System	1	LS	$15,000	$15,000
Operating Materials and Power	14	MO	$5,000	$70,000
Operating Labor	14	MO	$14,100	$197,400
				$6,682,000
ONSITE DISPOSAL SUBTOTAL				$11,522,000
Bid Contingencies			20.0%	$2,304,400
Scope Contingencies			25.0%	$2,880,500
TOTAL CONSTRUCTION COST				$16,706,900
Permitting and Legal			3.0%	$501,200
Services During Construction			7.0%	$1,169,500
TOTAL IMPLEMENTATION COST				$18,377,600
Engineering Design Cost			6.0%	$1,102,700
TOTAL CAPITAL COST				$19,480,000

CENTRALIZED ONSITE LAND DISPOSAL LONG-TERM ANNUAL O & M COSTS

COST ITEM DESCRIPTION	FREQUENCY	YEARLY COST
OPERATION AND MAINTENANCE		
Cover Regrading/Reworking	Annually	$18,000
Security System Maintenance	Semiannually	$1,800
Leachate Collection & Leak Detection Main	Periodic	$17,700
Leachate Treatment Plant O & M	Periodic	$9,000
Maintain Runon/Runoff Control Systems	Semiannually	$2,700
INSPECTIONS AND MONITORING		
Site Inspections	Monthly	$18,000
Groundwater Monitoring	Semiannually	$23,600
Leachate and Leak Monitoring	Periodic	$9,600
Security Patrols	Daily	$16,800
SUBTOTAL LONG-TERM ANNUAL O & M		$117,200
Administrative Costs	10 percent	$11,700
Contingency Costs	30 percent	$35,200
Insurance and Taxes	5 percent	$5,900
		$52,800
TOTAL ANNUAL O & M COST FOR ONSITE DISPOSAL FACILITY		$170,000

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Table A-12

ALTERNATIVE 6: CENTRALIZED LAND DISPOSAL OF EASTERN MISSOURI SOILS AT TIMES BEACH

SITE NAME	SOIL VOLUME, (a)	EXCAVATION COST (b)	DISPOSAL COST (c)	HAUL MILES	TRANSPORT COST (d)	NO. OF CLEANUP SECTIONS (e)	SAMPLING/ ANALYTICAL COST (f)	AIR MONITORING COST (g)	TOTAL SITE COSTS
RESIDENTIAL									
Stout Area	1,900	$0	$282,728	19	$72,200	18	$42,386	$10,127	$407,000
Romaine Creek	4,300	$0	$639,858	19	$343,140	36	$84,773	$22,919	$1,091,000
Lacy Manor	600	$252,000	$89,282	26	$65,520	6	$14,305	$3,198	$424,000
Bliss Ellisville	7,000	$2,940,000	$1,041,628	10	$294,000	71	$166,896	$37,310	$4,480,000
Comm. Christian Church	550	$231,000	$81,842	9	$20,790	6	$13,113	$2,932	$350,000
Manchester Meth. Church	300	$126,000	$44,641	9	$11,340	3	$7,153	$1,599	$191,000
Eureka-East North Street	750	$315,000	$111,603	4	$12,600	8	$17,882	$3,998	$461,000
Baxter Garden Center	1,500	$630,000	$223,206	15	$94,500	15	$35,764	$7,995	$991,000
subtotal	16,900	$4,494,000	$2,514,789		$914,090	171	$402,936	$90,077	$8,416,000
RESIDENTIAL/COMMERCIAL									
Highway 141 Access Road									
residential	520	$218,400	$77,378	13	$28,392	5	$12,398	$2,772	$339,000
mercial	100	$42,000	$14,880	13	$5,460	1	$2,384	$533	$65,000
East Texas Motor Freight									
residential	700	$294,000	$104,163	26	$76,440	7	$16,690	$3,731	$495,000
commercial	300	$126,000	$44,641	26	$32,760	3	$7,153	$1,599	$212,000
subtotal	1,620	$680,400	$241,063		$143,052	16	$38,625	$8,635	$1,112,000
NON-RESIDENTIAL									
Bull Moose Tube	300	$126,000	$44,641	44	$55,440	3	$7,153	$1,599	$235,000
Hamill Transfer	1,800	$756,000	$267,847	22	$166,320	18	$42,916	$9,594	$1,243,000
Jones Truck Lines	1,000	$420,000	$148,804	27	$113,400	10	$23,842	$5,330	$711,000
Overnite Transport	---			28		---	---	---	---
Southern Cross Lumber	1,300	$546,000	$193,445	25	$136,500	13	$30,995	$6,929	$914,000
Times Beach (h)	13,600	$5,712,000	$7,804,000	0	---	138	$324,256	$145,112	$13,985,000
Arkansas Best Freight	---			29		---	---	---	---
Bonifield Brothers Truck	2,100	$882,000	$312,489	22	$194,040	21	$50,069	$11,193	$1,450,000
subtotal	20,100	$8,442,000	$8,771,226		$665,700	204	$479,231	$179,757	$18,538,000

Table A-12 (cont.)

HORSE ARENAS SITES									
Timberline Stables	1,600	$672,000	$238,087	131	$880,320	16	$38,148	$8,528	$1,837,000
Bubbling Springs Arena	2,780	$1,167,600	$413,675	15	$175,140	28	$66,282	$14,817	$1,838,000
Saddle and Spur Arena	2,550	$1,071,000	$379,450	4	$42,840	26	$60,798	$13,592	$1,568,000
Shenandoah Stables	3,300	$1,386,000	$491,053	61	$845,460	33	$78,680	$17,589	$2,819,000
Piazza Road	7,800	$3,276,000	$1,160,672	68	$2,227,680	79	$185,970	$83,226	$6,934,000
Bliss Frontenac	750	$315,000	$111,603	19	$59,850	8	$17,882	$3,998	$508,000
subtotal	18,780	$7,887,600	$2,794,540		$4,231,290	190	$447,759	$141,749	$15,503,000
REMOVAL SITES (i)									
Castlewood	13,000	(included in past costs)	$1,934,453	14	$364,000	---		---	$2,298,000
Minker, Minker Neighbors	4,400		$654,738	19	$167,200	---		---	$822,000
Cashel Residence	1,000		$148,804	19	$38,000	---		---	$187,000
Sullins Residence	400		$59,522	19	$15,200	---		---	$75,000
Quail Run	16,000		$2,380,865	15	$480,000	---		---	$2,861,000
subtotal	34,800		$5,178,382		$1,064,400	---		---	$6,243,000
TOTAL	92,200	$21,504,000	$19,500,000		$7,019,000	581	$1,369,000	$420,000	$49,812,000

(a) Revised estimates reflect volume adjustments if contaminated areas which were not originally sprayed with contaminated waste oil (areas contaminated due to surface migration) require excavation to an average depth of 6 inches to achieve cleanup criteria. Sprayed areas are excavated to an average depth of one foot. Horse arenas excavated to an average depth of two feet, horse arena areas outside arena excavated to 1 foot, Shenandoah slough (100 x 100 ft) to 4 feet.

(b) Based on Missouri dioxin contract cos $420.00 per cubic yard. Romaine Creek and Stout excavation costs from Operable Unit Feasibility Studies.

(c) Offsite disposal cost $149 per cubic yard, onsite disp. cost $574 per cubic yard.

(d) Transport cost assumed per cubic yard-mile is $2.10 per cubic yard-mile, except as noted.

(e) Based on average 4,000 square foot sections, except Stout (known) and Romaine Creek (3 10-foot wide sections along creek), plus 50% additional to verify perimeter clean.

(f) Costs represent actual sampling and analytical costs during eastern Missouri removal actions, assuming 8 total 50-aliquot samples per cleanup section at $294 per sample collection/analysis.

(g) Air monitoring costs assume $320 per sample, 5 monitors per site, 1 sample per 3 days per monitor, 100 cubic yards per day excavated. 10 monitors assumed for Times Beach and Piazza Road.

(h) Excavation cost includes onsite land disposal of structures and debris ($6,836,000) from Times Beach FS.

(i) Transport costs from Times Beach FS. Soil volumes actual for all except Castlewood (estimated).

RESPONSIVENESS SUMMARY

RECORD OF DECISION
FOR
FINAL MANAGEMENT OF
DIOXIN-CONTAMINATED SOIL AND
FINAL DISPOSITION OF STRUCTURES AND DEBRIS AT
TIMES BEACH, MISSOURI
and the
MINKER/STOUT/ROMAINE CREEK SITE, MISSOURI

Prepared by

U.S. ENVIRONMENTAL PROTECTION AGENCY

September 28, 1988

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RESPONSIVENESS SUMMARY

Record of Decision for
Final Management of Dioxin-Contaminated Soil and Final Disposition of Structures and Debris at Times Beach, Missouri
and the
Minker/Stout/Romaine Creek Site, Missouri

This Responsiveness Summary presents responses of the Environmental Protection Agency (EPA) to public comments received regarding remedial actions for dioxin-contaminated soil at Times Beach and the Minker/Stout/Romaine Creek site (M/S/RC), and final disposition of uncontaminated structures and debris at Times Beach. This document addresses all comments received by the Agency during three public comment periods conducted as part of the remedy selection process. Several additional comments were received by the Agency following the close of the most recent public comment period. All such comments received prior to publication of this responsiveness summary have also been addressed.

INTRODUCTION

On February 19, 1988, EPA announced its proposed plan for the cleanup of Times Beach and the Minker/Stout/Romaine Creek site. Under the plan, structures and debris remaining in Times Beach following the permanent relocation would be demolished and disposed of onsite. Dioxin-contaminated soils at Times Beach exceeding a level of concern for protection of public health and the environment would be excavated and treated by thermal destruction at a temporary unit located onsite. Dioxin-contaminated soils from the nearby Minker/Stout/Romaine Creek site would also be transported to Times Beach for thermal destruction. The proposed remedy would establish management capacity for a finite number of dioxin sites located in eastern Missouri which are listed in the Proposed Plan.

A primary feature of the proposed remedy is the cleanup of structures and debris at Times Beach. This material consists of 440 structures, 77 mobile homes, 60 outbuildings, and approximately 7,000 additional cubic yards of general debris. The proposed plan includes the demolition of all structures and onsite land disposal of the general and demolition debris in a solid waste disposal facility constructed onsite in accordance with state regulations. Disposal of structures and debris which are not located in dioxin-contaminated portions of Times Beach could begin prior to cleanup of contaminated soils. These uncontaminated areas are generally located along Interstate 44 in highly visible areas. The demolition and removal of structures within the former city limits of Times Beach, south of Interstate 44, and those south of Blakey and Lewis Roads will be given priority. It is estimated that this work can begin within one year of remedy selection, and completed within an additional year. The appearance of Times Beach from Interstate 44 would therefore be substantially improved in the initial phase of the project.

Demolition and disposal of structures and debris located in contaminated portions of Times Beach would be performed following cleanup of contaminated soils. This is due to the high costs associated with construction activities when protective clothing is required for site workers. Cleanups conducted under the funding and authority of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, (CERCLA) must be cost-effective. It is therefore necessary to perform the soil cleanup prior to initiating demolition and disposal of structures and debris in some portions of Times Beach. These contaminated areas are, however, less visible from Interstate 44 than those areas where cleanup of structures and debris can be performed early in the project.

The proposed cleanup of Times Beach soils is in accordance with the recommendations of state and Federal health agencies. EPA has been working with these health agencies since 1982 to determine an appropriate cleanup level for soils at Times Beach. In 1984, the Centers for Disease Control (CDC) published a health assessment which has formed the basis for the cleanup levels established for dioxin sites in Missouri, including Times Beach. The CDC, through the Agency for Toxic Substances and Disease Registry, has advised that soils exceeding 1 part per billion (ppb) at the surface, or exceeding 10 ppb at one foot depth, are of concern for protection of human health in residential settings. Higher cleanup levels would be acceptable in certain other settings. CDC has recommended that in certain industrial or commercial settings, a cleanup level of 20 ppb would provide protection of public health.

A cleanup level of 20 ppb has been established for Times Beach by EPA on the basis of recommendations from Federal and state health agencies. This cleanup level is appropriate for the Times Beach site and consistent with future land uses that include park areas or green space. Future land use at Times Beach is controlled through the existing contract for the permanent relocation and also through requirements of the Missouri State Hazardous Waste Management Law. These controls will assure that the proposed cleanup of Times Beach continues to surpass all criteria for protection of human health and the environment. Local zoning ordinances may be established to further ensure that land use remains compatible with the cleanup and local interests.

The proposed remedy involves temporarily siting a thermal treatment unit at Times Beach for treatment of onsite soils and other specifically designated materials. Soils at Times Beach exceeding 20 ppb would be excavated and transported to the onsite thermal treatment unit. The specific location and landscaping of the thermal treatment unit will be presented to the City of Eureka for review prior to final design. The City may comment on the proposed location, and the views and requests of the City will be accorded consideration. It is EPA's intent to locate the thermal treatment unit in the most remote area practicable and minimize visibility from Interstate 44 and the neighboring residences. EPA will also assure the availability of water at Times Beach during all phases of the project, as requested by the local fire protection district.

The thermal treatment unit would be subject to a RCRA permit issued by the State of Missouri. The RCRA permitting process is, by statute and regulation, subject to public participation requirements. The local community will therefore have an opportunity to provide input during the permitting process. It is EPA's intent that a permit be sought only for the thermal treatment of material from Times Beach and the other dioxin sites listed in Table 1 of the Proposed Plan. Times Beach would not be available to accept out-of-state wastes. It is EPA's intent to operate the thermal treatment unit only as long as is necessary to treat the materials specified in the Proposed Plan and Record of Decision. It is estimated that the project could be completed within six years of issuance of a RCRA permit for the thermal treatment unit.

The proposed remedy would be implemented under stringent safety requirements. The primary consideration for the cleanup is short- and long-term protection of human health and the environment. The state-issued permit represents one means of limiting the project duration and specified sources of material to be treated. The permit would also assure that the dioxin contamination is completely and safely destroyed.

Safety of the thermal treatment process is assured by provisions of the state-issued permit, and verified by continuous monitoring which will be performed throughout the project. The operating parameters of the thermal treatment unit and emission controls are continuously monitored to assure that conditions can not develop which would result in a release of contaminants to the environment. The unit would be equipped with safety features to initiate automatic shut-down if operating conditions exceed the acceptable range. Negative pressure within the unit would assure that no release of contaminants could occur. In addition, 24-hour ambient air monitoring would be performed at multiple locations both onsite and offsite to verify that no release of contamination occurs. Local officials may conduct independent monitoring of the thermal treatment unit at their election at reasonable times.

Thermal treatment offers many advantages relative to other remedial alternatives. The process is odorless and there are no discharges of any type into the Meramec River or harmful air emissions. The residue resulting from the thermal treatment of soil is a non-hazardous solid waste. Thermal treatment represents a permanent remedy for dioxin-contaminated soils and allows future beneficial use of the site.

The proposed remedy includes the transportation of dioxin-contaminated soils from the Minker/Stout/Romaine Creek site to Times Beach for thermal treatment. In addition, a number of specific sites are identified which represent potential sources of dioxin-contaminated soils which may be transported to Times Beach for thermal treatment, depending on remedies selected for these sites in the future. Safety during the transportation of offsite material to Times Beach is another primary concern. Transport of soil would only be conducted by fully licensed companies with experience in the transportation of hazardous materials. Covered trucks with sealed beds would be used to control the potential for release of contaminated material. A transportation study would be performed prior to route selection. Non-peak hours and non-residential haul routes would be used to the extent possible. The locations of schools, hospitals, and other public facilities would be considered in the selection of transportation routes. Plans outlining transportation routes and scheduling will be submitted to local authorities for review and comment. Development of the final transportation plan will be coordinated with local authorities.

A safety contingency plan would be developed to provide emergency response in the event of any transport accident. Radio communication would provide immediate alert if an accident occurred. Response vehicles would be available for emergency cleanup and transportation of contaminated soil. The likelihood of an accident resulting in spillage of contaminated soil is small due to the safety precautions employed and cautious procedures which will be used during transportation.

Following completion of the proposed remedy at Times Beach, beneficial use of the land will be possible. The cleanup will allow use of the land as a green space, park areas with recreational use, and potential commercial development. Access to Times Beach will not be restricted. The restoration of Times Beach will result in positive impacts to the local community.

PUBLIC PARTICIPATION

In July, 1986, the Agency released the Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site. This study evaluated remedial alternatives for the dioxin-contaminated soil being temporarily stored at the site, located approximately six miles south of Times Beach. One option evaluated consisted of offsite thermal treatment at a nearby centralized facility within 50 miles of the Minker/Stout/Romaine Creek site. A public comment period was held from August 8, 1986 through September 5, 1986, for the Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site. A public meeting was held on August 25, 1986, to discuss the alternatives evaluated in the study and the Agency's proposed remedy.

The Times Beach Feasibility Study was released for public comment from December 29, 1986, through March 27, 1987. A public meeting was held on February 12, 1987, to discuss alternatives evaluated in the study and to present the Agency's proposed remedy. A total of 109 written responses were received during the public comment period on the Times Beach Feasibility Study. Many of these responses consisted of form letters from the local community.

The primary concern expressed during the February 12, 1987, public meeting was the potential permanence of the proposed temporary thermal treatment unit at Times Beach. The Agency is sensitive to the concerns of the surrounding communities. A thermal treatment facility sited at Times Beach will only be used to treat dioxin contaminated soils originating from Times Beach and the other potential sites listed in Table ____. The Record of Decision also includes restrictions on the length of time that the unit may operate.

A Proposed Plan for Final Management of Dioxin-Contaminated Soil and Final Disposition of Structures and Debris at Times Beach, Missouri and the Minker/Stout/Romaine Creek Site (Proposed Plan) was released by the Agency for public comment on February 19, 1988. A public meeting to discuss the Proposed Plan and the Agency's preferred alternative. The public comment period on the Proposed Plan was concluded March 18, 1988.

This responsiveness summary is organized into three sections. The first section addresses comments received during the public comment period for the Proposed Plan. The latter two sections address comments received regarding the Times Beach Feasibility Study and the Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site. Attached to this responsiveness summary are two memoranda for record and one letter which were prepared by the U.S. Army Corps of Engineers in response to technical questions received regarding construction of levees at Times Beach and the associated impact on flood heights.

This Responsiveness Summary represents a component of the Record of Decision (ROD) package, which also includes the ROD declaration, ROD summary, and index to the administrative record. Formal selection of the remedy to be implemented for Times Beach and the Minker/Stout/Romaine Creek site occurs by signature of the ROD declaration by the Assistant Administrator for the EPA Office of Solid Waste and Emergency Response.

Following ROD signature, a pre-design phase will be initiated. During this phase, specific details and procedures to be followed during implementation of the remedy will be developed.

Following completion of the pre-design phase, the design of the remedy will be initiated. During the design phase, the bid specifications which will be advertised for proposals will be developed. This design will be based upon the detailed implementation plans developed during the pre-design phase. Once design has been completed, a request for proposals (RFP) will be advertised for implementation of the project described by the bid specifications. Implementation of the remedy will commence upon award of the construction contract(s) to the successful bidder(s).

SECTION I

PROPOSED PLAN FOR FINAL MANAGEMENT OF DIOXIN-CONTAMINATED MATERIALS AND FINAL DISPOSITION OF STRUCTURES AND DEBRIS, TIMES BEACH, MISSOURI AND THE MINKER/STOUT/ROMAINE CREEK SITE, MISSOURI

INTRODUCTION

In February, 1988 the U.S. Environmental Protection Agency released a Public Comment Draft Proposed Plan for Final Management of Dioxin-Contaminated Soil and Final Disposition of Structures and Debris at Times Beach, Missouri and the Minker/Stout/Romaine Creek Site, Missouri. A public comment period for the Proposed Plan was held from February 19 to March 18, 1988 and a public hearing was held on March 10.

This responsiveness summary summarizes the public comments made to the Proposed Plan. These comments include those statements made at a public hearing held in Eureka, Missouri on March 10, 1988, as well as written comments received by EPA prior to the close of the public comment period on March 18. EPA responses to the statements received by the public are included in this responsiveness summary.

The responsiveness summary for the Proposed Plan is organized in the following fashion: first, statements made at the public hearing are summarized and EPA responses to the statements are presented. Then, written comments from the public, PRPs, and other parties are provided with appropriate EPA response.

COMMENTS RECEIVED AT THE PUBLIC HEARING

In this section, the public comments received by EPA at the public hearing on March 10 are summarized. EPA responses to the comments are provided.

> **Several commentors expressed concern that the incineration facility at Times Beach would be used to treat hazardous wastes other than those identified in the Proposed Plan and that material would be brought to the site from out of the state.**

As stated in the Proposed Plan and Record of Decision, EPA does not intend to incinerate any material at Times Beach other than that described in the Proposed Plan. The centralized thermal treatment facility would be constructed to provide final remediation for the dioxin sites in eastern Missouri identified in the Proposed Plan and Record of Decision. Material from outside of the state will not be taken to the site for treatment or other management. The State of Missouri will control the material which is transported to Times Beach for treatment, since the State-issued permit will limit the sources and amount of material which the unit can treat. The State will also gain control as site owner, since the title to all properties in Times Beach will be conveyed to the State following completion of the permanent relocation.

Only dioxin-contaminated material from the specified sites will be treated at the facility. A limited amount of soil located onsite at the former city park area may be treated at the onsite facility, if it is determined in the future that thermal treatment of this material meets CERCLA remedy selection criteria. This material would be treated at Times Beach only if allowed by the RCRA permit issued for the unit. Dioxin-contaminated soils at the Ellisville site, if treated at Times Beach, may be contaminated with other non-dioxin constituents. This material will be treated at Times Beach only if allowed by the RCRA permit issued by the State for the unit.

The length of time that the facility would be left in place at the site and the sources of material to be taken there would be controlled through a permit issued by the State. The maximum duration for a RCRA permit is limited by Federal regulations to ten years (40 CFR 270.50), although it is estimated that the project can be completed within 6 years of issuance of the permit. A state permit will be sought to operate the unit for a period not to exceed six years. Public participation would be an integral part of the process of securing this permit.

> **EPA was asked if it would guarantee that an incineration facility at Times Beach would not become a permanent facility and that incineration equipment would be removed at the completion of the remedial activities. EPA was further asked if they could guarantee the date that the incinerator would be constructed, what the remedial activities would cost, and what would be done at the site. EPA was asked if the safety of the operation could be guaranteed.**

The EPA will guarantee that the thermal treatment unit to be located at Times Beach will be temporary and only dioxin-contaminated soils from those potential sites identified in the Proposed Plan and Record of Decision will be considered for treatment at Times Beach.

Following the selection of a remedy, efforts will be directed toward defining aspects of the specific remedy to be used. These efforts will include closer engineering evaluation of issues relevant to the remedial action. Following this detailed evaluation, the remedial action will be designed. Attempts will be made throughout this process to better define costs, the project schedule, and safety and other features of the remedial action. The public will be invited to participate throughout the period of development.

The thermal treatment unit will be operated under stringent operating conditions specified by the state permit. The trial burn will verify that operation of the thermal treatment unit under these conditions results in the safe destruction of dioxin. These operating conditions combined with the redundant safety features designed into the unit will assure the continued safety of the public and site workers during implementation.

> **Several commentors expressed concern about the traffic problems and risks from traffic or railway accidents that might be posed by the transportation of dioxin-contaminated material to Times Beach from other areas.**

EPA shares these concerns. The use of a railroad for transporting the material is not planned. Transportation considerations are limited to movement by road.

It is EPA's intent to develop the plan for the remedial action to minimize the likelihood of accidents or spills. Licensed waste haulers with experience in transporting hazardous materials would be used. Other measures that are being considered to prevent accidents and spills include the use of air-tight truck beds with gasketted roll-off boxes, transport only during non-peak hours, and the use of non-residential roads to the greatest extent possible. The locations of schools, hospitals, and other public facilities would be considered in designating transport routes. Radio communication and escort vehicles will be considered as well. A traffic study will be performed early in the planning for the remedial action. Local coordination will be a key factor in the development of a transportation plan. The local community will have an opportunity to provide comments during the development of the transportation plan. The comments and concerns of the local community will be considered in the final plan. Contingency measures will be developed as well to provide immediate response in the unlikely event of an accident or spill.

> **EPA was asked if clean-up procedures had been developed to be used if there was an accident or a spill while dioxin-contaminated soil was being transported to Times Beach.**

As noted previously, detailed safety plans will be developed during the next phase of the project. The plans will include provisions for immediate alert if a spill occurs and cleanup of spilled material using vacuum equipment or other equipment as appropriate, with containerization and transport. These measures will ensure that no exposure exceeding a level of concern will occur. All material being transported will be solid. No liquid waste will be transported to Times Beach, which will substantially reduce the potential for migration in the event of an accident.

> **A commentor asked if EPA had determined the final classification of the ash from the incinerator, where the ash would be stored, and how the ash would be treated. EPA was also asked if the treated materials coming from the incinerator would be safe.**

During the incinerator trials at Denney Farm, the destruction of dioxin in soil in the incinerator exceeded 99.9999 percent. In fact, no traces of dioxin were detected in any emissions from the incinerator during the project, including the ash. Similar destruction is expected for soil treated at Times Beach.

Based on the trial work conducted at Denney Farm, EPA expects that the ash from an incinerator at Times Beach would be nonhazardous and can be delisted. The delisted ash would be considered a non-hazardous solid waste. The ash will tested and verified to be non-hazardous prior to disposal. As noted in the Proposed Plan, the ash will be disposed of onsite in a State-approved solid waste landfill.

> **EPA was asked if the Agency had developed an evacuation plan that would be used if flooding occurred at the site while the incinerator facility was operational.**

Flood control and contingency measures will be an important part of the detailed planning for the project. Since the detailed planning for the remedial action has not been performed, these plans have not been developed. The thermal treatment unit will be protected to withstand a 100-year flood. There should be no need to evacuate the equipment. In addition, the Corps of Engineers has the HEC-2 computerized hydraulic model calibrated for the Meramec River. Flooding on the Meramec River can be predicted allowing for the lead-time necessary to evacuate non-protected equipment and personnel. Contingency plans will be developed to control the release of any hazardous substances in the event of flood exceeding the 100-year flood stage.

> **EPA was asked why the estimates of dioxin-contaminated material to be remediated had changed over the years.**

Over the years removal actions have been conducted at several sites and a number of sampling events have been performed. These actions have provided greater refinement of the estimate of the soil volumes that are expected to be remediated during the remedial actions. In addition, extensive soil sampling has recently been completed at Times Beach which has confirmed the lateral extent of contamination throughout the site. EPA is confident that the present estimates are relatively precise, although it is likely that the final volumes actually remediated will differ slightly from the present estimates.

> **EPA was asked if the air monitoring and shutdown procedures that would be used for the incinerator had been developed. In particular, a commentor expressed concern that there may be no devices for continuously monitoring air emissions from the incinerator.**

A trial burn will be conducted to establish the conditions under which the thermal treatment unit must be operated to achieve destruction of the dioxin contamination. During the trial burn, dioxin-contaminated material will be thermally treated in combination with selected substances which are more difficult to thermally destruct than dioxin. The ash and emissions from the stack will be tested for dioxin during this trial burn, and the destruction efficiency for dioxin and these other substances will be measured. This trial burn will determine the operating conditions which result in the safe destruction of dioxin. The state-issued permit will require that the thermal treatment unit must be operated under the conditions which have been determined to safely destroy dioxin without harmful emissions.

The development of appropriate air monitoring and shutdown procedures will be an important part of the detailed planning effort. Contemporaneous dioxin levels can not be monitored continuously at the stack. However, the stack emissions will be continuously monitored for other parameters which indicate the efficiency of the treatment and destruction process. In addition, the operating conditions of the thermal treatment process will be continuously monitored to assure that the unit is operated under the conditions which were determined to be safe during the trial burn. Operation of the thermal treatment unit under these conditions assures that dioxin is completely destroyed.

> **EPA was asked if ash and pollutants from the incinerator would be released into the atmosphere.**

A thermal treatment unit used to treat dioxin-contaminated soil will feature very extensive air-pollution control equipment. The equipment will include a high temperature chamber to ensure that organic material such as dioxin is destroyed, and extensive exhaust cleaning equipment. This equipment will remove particulates and other pollutants from the exhaust of the unit.

The stack emissions will be monitored continuously, and 24-hour ambient air monitoring will be performed onsite and offsite to assure the safety of the operation.

Control of emissions from the incinerator at Denney Farm and other dioxin incinerator trials has been successful. It is expected to be equally successful for the remediation at Times Beach.

> **A commentor asked EPA if the buildings at Times Beach could be torn down since the buildings are an eyesore.**

As noted in the Proposed Plan and Record of Decision, it is EPA's intent to remove the buildings at Times Beach and place the building materials in a solid waste landfill constructed at the site.

> **EPA was asked if the Clean Air Act would be met during incinerator operations and if the incineration facility could receive a permit.**

The thermal treatment unit will be designed to meet all Clean Air Act requirements. Previous trials have demonstrated that the provisions of the Clean Air Act can be met. EPA anticipates that the proposed remedy will meet all statutory and regulatory provisions under the Clean Air Act and will be capable of receiving a permit under this authority.

> **A commentor asked EPA if the reason that Times Beach would be used for the incineration facility was Government ownership of the Times Beach property. The commentor suggested that Times Beach was not a good location and that the incinerator should be placed somewhere else because of the flood plain and requirements for clay.**

There are a number of reasons that the Times Beach site has been recommended for the siting of a thermal treatment unit to treat dioxin-contaminated material. The reasons include: a State request that the site be considered for a centralized thermal treatment unit, government ownership of the property, the amount of land that is available at the site which is not available at any other identified potential site, access to the site from the highway, the relatively large volume of dioxin-contaminated material at the site, and the proximity of the site to other dioxin sites. The siting of such a facility on the flood plain is not considered to present unusual engineering difficulties since a ring levee can be constructed to protect the facility. In addition, onsite soils and terrain are suitable for implementation of the project. Underlying clay requirements which preclude construction of a permanent land disposal facility are not applicable to a temporary thermal treatment facility.

EPA was asked if the incinerator was safer than the bunker that had been proposed earlier, particularly in light of the additional traffic generated by transport of the dioxin-contaminated material to the Times Beach incineration facility.

Both the bunker and the thermal treatment unit would be protective of human health and the environment. The volume of material that would be transported for either a bunker or centralized thermal treatment unit would have been similar. For the bunker however, a large volume of material would have been transported to the site over a relatively short period of time compared to the centralized thermal treatment facility. It is likely that traffic control would have been much more difficult for the bunker.

A commentor asked if the contaminated soil at Times Beach should be covered and further remedial action delayed until the incineration technology is proven.

EPA believes that the thermal treatment technology is sufficiently well developed and that further delay is unnecessary. Incinerators have been successfully used to treat dioxin-contaminated soil at the Denney Farm site and Johnston Atoll. Pilot units were successfully used at Times Beach.

Evidence from the site indicates that migration from the site is not a significant problem now, and temporary capping is not needed while awaiting the start of onsite excavation and thermal treatment activities.

EPA was asked if state permission and permitting to build the incineration facility would be needed since the State of Missouri will own Times Beach at the completion of the buy-out.

EPA must obtain access from the State for implementation of the proposed remedy. Since the State requested that the Times Beach site be considered for the siting of a centralized thermal treatment facility, state permission is expected. State permits will be needed to treat material from offsite and to dispose of the ash from thermal treatment. The performance of the unit is expected to meet State requirements.

EPA was asked if the Agency had determined the activities that would be allowable at the site following excavation of soil above 20 ppb and capping of soil from 1 to 20 ppb.

Based upon the recommendations of health agencies, certain non-residential soils, including Times Beach soils, which contain dioxin levels less than 20 ppb do not represent a concern for public health. Since soils exceeding 20 ppb at Times Beach will be incinerated, and soils containing dioxin at concentrations from 1 to 20 ppb covered, the remedial actions are considered relatively conservative for non-residential exposure to the soil.

Although EPA will not determine the final site usage, the Agency believes that remediation will allow the site to be used as a park or green space or other similar usage.

Due to the limited extent of contamination at Times Beach, the proposed remedy will actually achieve residential cleanup criteria in the majority of the site. In fact, over 97% of the site will have a final dioxin level of 1 ppb or less, or 10 ppb or less at depths greater than one foot, which is below a level of concern for residential use, as recommended by state and federal health agencies.

> **EPA was asked if an incineration facility for dioxin-contaminated material could be built in another, less prosperous or less populated part of the state. It was suggested that this might be beneficial for the less prosperous areas since jobs would be created in the areas. It was also noted that several communities in these less prosperous areas had been trying to get incineration companies to locate incineration plants in their communities. A commentor also asked if an area outside of St. Louis County that had adequate rail transportation would be a more acceptable location for an incineration facility.**

EPA believes that Times Beach is an appropriate location for the siting of a centralized thermal treatment facility for reasons already presented. Constructing such a facility at another area in the state would significantly increase the distances required to transport the contaminated material. Some degree of public opposition from the local community would be expected at any location proposed for any type of hazardous waste activity. The communities near an alternate location for thermal treatment which was suggested during the public meeting have recently expressed opposition to siting of a centralized unit in their area.

> **Several commentors asked if the impact on the local economy from construction of an incinerator had been determined. In particular, concern was expressed about an incineration facility at Times Beach creating negative publicity about the area, depressing the local economy, lowering property values, and affecting the local resort businesses.**

The Times Beach site is believed to be currently affecting the local economy. After cleanup, this impact will be reduced. The operation of the thermal treatment unit will be coordinated with the local community to minimize the impact to the local economy during operation. The location of the unit at Times Beach will be selected, in coordination with the local community, to minimize visibility from Interstate 44 and neighboring residences.

> **EPA was asked why several pieces of property at Times Beach had not yet been bought out and why people whose property had not been bought out could not go onto the site to see their property.**

Acquisition of all property included in the permanent relocation has not been completed. The remaining properties will be acquired through condemnation due to title problems. Condemnation procedures have caused delays but are expected to be finished this year.

The State currently controls access to the site. Arrangements should be made with the State to enter the site with an escort in accordance with health and safety requirements.

> **Support was expressed for the incineration of dioxin-contaminated material at Times Beach.**

EPA believes that the centralized thermal treatment represents a permanent remedy offering management capacity for all identified potential eastern Missouri sites.

> **EPA was asked if sand, gravel, sewer lines, and soil could be placed on the site, and the area turned into a hard-surface recreational area or light industrial area.**

EPA has considered this as well as other alternatives. The remedial alternative suggested by the commentor is an example of in-place containment alternatives. In-place containment alternatives do not achieve remedy selection criteria under CERCLA, as amended, to the same extent as thermal treatment of contaminated soils. Specifically, in-place containment alternatives do not permanently destroy the dioxin, are not cost-effective, and would likely have significant engineering difficulties in implementation. Other in-place containment alternatives were evaluated in the remedy selection process which achieve a degree of control equivalent to the alternative suggested by the commentor at a substantially lower cost.

> **A commentor suggested that incineration can be a safe process and that there would be no emissions or residue from the incinerator stack.**

EPA agrees with the commentor.

EPA was asked what public participation had been involved in the selection and construction of the spur levees at Times Beach.

As explained at the public hearing, public participation requirements were met with the Central Storage Site Report and Record of Decision, which included the spur levees. A Flood Plain Assessment for the project also prepared and announced, also with public opportunity to respond.

EPA was asked if the people in Fenton had been notified of the public meeting.

A legal notice announcing the meeting was placed in the St. Louis Post Dispatch on February 19. The same paper ran a front page article February 20 announcing the meeting. Numerous additional articles also ran in local newspapers. Over 200 fact sheets and Proposed Plans were distributed to local media and elected officials in advance of the meeting.

EPA was asked if other non-incineration processes would be considered for remediation at the site. Several commentors suggested that they had non-incineration processes that could be used to remediate Times Beach.

As noted at the public meeting, EPA has closely examined a number of other remediation processes in the past and knows of no other technology capable of destroying the dioxin as safely or completely as thermal treatment. Although EPA will examine other promising technologies, thermal treatment is considered to be the only proven technology available for treatment of dioxin-contaminated soil in Missouri.

All thermal treatment processes will be considered during design of the remedial action for the site; performance-based bid specifications will be developed that will outline the requirements for the performance of the thermal treatment unit. These requirements will include destruction of dioxin exceeding 99.9999 percent and delisting of the ash from the process.

EPA was asked if a dioxin concentration of 20 ppb at the soil surface would be acceptable for children to play on or acceptable for commercial purposes.

On the basis of recommendations from state and Federal health agencies, EPA believes that reducing surface concentrations to less than 20 ppb would be protective for certain non-residential usages, including recreational or commercial. As an additional measure of protection, a one-foot vegetated soil cover will be placed over areas with residual dioxin concentrations between 1 and 20 ppb. This will provide a barrier and result in dilution of subsurface soils in the event of soil disturbance. All remaining surface concentrations at Times Beach following remediation will be less than 1 ppb.

A commentor asked if there was a potential danger for dust and other particulates to be released into the air during materials handling and preparation activities.

Specific measures to control the generation and release of dust and other particulates will be selected during the detailed planning for the project. These measures will be selected to prevent the release of such material, and would include the application of dust suppressants and air monitoring onsite and offsite.

A commentor expressed support for EPA's activities and indicated that EPA had done a fine job remediating the Quail Run site.

EPA believes that the remedy at Times Beach can be equally successful, restoring the site to beneficial use.

A commentor asked if there would be periods when the incinerator would be cleaned and leakage could occur.

The thermal treatment unit would periodically be shut down and collected material removed. This shutdown would be preceded by a period when the unit is operated at high temperature with no feed material. This would be done to destroy any dioxin in the incinerator. Leakage would not present a problem during the cleaning. Material removed from the incinerator during maintenance would be disposed as a solid waste.

EPA was asked if the incinerator facility would be as high as a six-story building.

Although certain portions of the facility, such as the exhaust stack, may be relatively tall, the overall facility would be approximately 20 feet tall. Since the facility would be surrounded by a ring levee, it would be difficult to see much of the facility at a distance.

EPA was asked if the incineration technology was really developed and if an incinerator to be used at Times Beach had been constructed.

Thermal Treatment technology is well-developed. The technology is being used across the world to destroy hazardous as well as other wastes.

While many thermal treatment units that have already been constructed could be used at the Times Beach site, it is not known if the specific unit that would be used at the site has been constructed. Performance-based specifications will be developed during the design. The unit to be used at the site would have to meet the performance criteria outlined in these specifications.

EPA was asked where the cooling water for an incinerator would be disposed.

Cooling water would be treated, stored while the water was analyzed, and land applied at the site if the water was shown to meet requirements for discharge of the water. The water would meet all State permit requirements for disposal of such water.

EPA was asked why the proposed location for the incinerator was near a railroad since the incineration facility was only intended to be a temporary facility.

The specific location of a thermal treatment unit on the site has not been determined. This will be an issue for the detailed design of the facility and will be determined in consideration of comments and concerns of the local community. The location mentioned in the Proposed Plan is a possible location, and was mentioned only because the location appears to offer advantages in terms of visibility from Interstate 44 and the impact on flood heights. Other options will be considered.

A question was asked about how EPA would ensure that the drinking water in the area would be protected, particularly the water drawn from the Meramec river.

The actions being proposed by EPA will further ensure that water is protected since dioxin-contaminated material will be excavated and the dioxin destroyed. Any process water generated during the remediation efforts will be treated to meet all permit requirements prior to discharge of the water on the land. Samples of the Meramec River water will be taken at the intake to public water supplies to monitor the quality of the water.

EPA was asked if the public comment period for the Proposed Plan could be extended.

EPA believes that the period afforded for comment by the public on the Proposed Plan was adequate. The public comment period closed March 18, satisfying statutory and regulatory requirements for public comment. There was a three month comment period for the Times Beach Feasibility Study, which evaluated similar alternatives.

EPA was asked what measures would be taken if soil leaked from the trucks transporting the contaminated soil and local citizens experienced allergic reactions to the dust.

As noted previously, measures will be taken to prevent release of dust from trucks transporting the contaminated soil. This is not expected to be a problem. In addition, no transport of liquid wastes is being proposed.

EPA was asked if the decision for the site had already been made and if the comments made at the public hearing would actually be considered in making a decision.

All public comments will be considered when the remedy is selected. The remedy will be formally selected in the Record of Decision.

EPA was asked if the soil cover for certain areas could be washed away and residual dioxin-contaminated soil exposed.

Since soils exceeding a level of concern for protection of human health are being removed, the continued integrity of the soil cover is not critical to maintaining the effectiveness of the remedy. However, measures are being taken to control the potential for erosion. Spur levees currently being constructed will control the velocity of the flood water and will reduce erosion potential. The design of the soil cover will further reduce the potential for exposure of contaminated soil due to erosion.

Several alternate solutions were suggested for the site, including plowing the soil and exposing the material to the sun, and confining the site with dikes and capping the material.

A number of remedial options have been considered for the site.

Exposure of contaminated soils in eastern Missouri to sunlight has not been found to effectively reduce dioxin concentrations to acceptable levels. For example at the Castlewood site, sampling of dust samples collected from the pavement surface detected dioxin levels of 40 ppb. If sunlight were determined to effectively destroy dioxin at the soil surface, there would be no reduction in dioxin concentrations immediately beneath the surface, which would require that the subsurface soils be continually brought to the surface, which could be accomplished by plowing. However, it is likely that the process of plowing would release contaminated soil particles into the air, thereby increasing exposure potential. Since soil sampling has not determined that ultraviolet degradation of dioxin effectively reduces dioxin levels in eastern Missouri soils, this alternative was eliminated from further consideration.

In-place containment alternatives were evaluated in the Proposed Plan and Feasibility Study for Times Beach and rejected. In-place containment alternatives do not satisfy CERCLA remedy selection criteria to the same degree as the selected remedy. In-place containment does not represent a permanent remedy which utilizes treatment as a principal element to reduce the toxicity, mobility, or volume of hazardous materials at the site. In-place containment alternatives are dependent upon ongoing monitoring and maintenance to assure long-term protection of human health and the environment. In-place containment is not capable of achieving all identified ARARs, particularly landfill closure and post-closure requirements under RCRA and siting requirements under the Missouri Hazardous Waste Management Law.

A commentor asked why detailed engineering plans had not been released on how the dioxin-contaminated material would be incinerated.

As noted previously, specific features of the selected remedial action will be evaluated in greater detail following selection of a remedy. Detailed engineering plans have not been developed thus far, but will be as part of remedial action design effort.

EPA was asked if it was justifiable to cleanup the site to anything greater than 1 ppb and if rationale for the 20 ppb action level described in the Proposed Plan was available. It was suggested that the 20 ppb action level was not satisfactory.

The 20 ppb action level selected for Times Beach is considered by EPA to be protective of public health and the environment. The 20 ppb action level is based on a 1984 risk assessment performed by Dr. Renate Kimbrough et al., Center for Environmental Health, Centers for Disease Control and subsequent correspondence from federal and state health agencies. Correspondence summarizing the rationale for 20 ppb were attached to the Proposed Plan.

EPA was asked if additional contaminated material would be placed in the city park.

No contaminated material will be placed in the city park.

A commentor asked about the status of the Bubbling Springs site and why the site had not been remediated.

Residential sites in Missouri have been prioritized for cleanup. The Bubbling Springs cleanup is under development, but has not been scheduled yet. The site is one of those noted in the Proposed Plan that could potentially be managed using the centralized thermal treatment unit that would be constructed at Times Beach.

EPA was asked why the incinerator for the Times Beach site, if it was mobile, could not be taken to the other sites outlined in the Proposed Plan for incineration at Times Beach and the incineration performed at those areas.

There are several important difficulties that preclude taking the thermal treatment unit to each of the individual sites. First, there is not enough open acreage available at many of the areas to site such a unit. Second, the overall cost would be significantly higher, due in part to costs associated with mobilization and demobilization, and permitting of the incinerator. Centralized thermal treatment is considered to be much more cost-effective than taking a unit to each individual site.

EPA was asked about the status of Technical Assistance Grants and when the grants would be available to local communities.

On March 24, 1988, EPA published an interim final rule for providing technical assistance grants of up to $50,000 in the Federal Register (53 FR 9736). These grants are available to qualifying citizen's groups for the purpose of obtaining assistance in interpreting information related to cleanups at Superfund sites. EPA anticipates award of these technical assistance grants to begin in the fall, 1988.

One commentor recommended that the site be left as it is for the time being since the health effects of dioxin to humans are not thought to be significant.

The no action alternative is not considered by EPA to be acceptable for the site. The potential for exposure continues to exist and buildings at the site continue to deteriorate, resulting in an unacceptable risk to public health and the environment. A long-term remedy that is compatible with regulatory requirements and provides protection of human health and the environment must be selected; no action is not considered to be a satisfactory selection.

EPA was questioned about the heights of the spur levees being constructed at Times Beach and their

effects on flood heights.

Minimal impacts on the flood heights are expected from the spur levees. This issue was addressed in the public meeting by a member of the Corps of Engineers. Further explanation is provided in a letter attached.

WRITTEN COMMENTS RECEIVED FROM THE PUBLIC

A number of commentors provided written responses to the Proposed Plan. Comments not previously addressed in the public meeting are discussed below. The comments are organized into several categories, including general comments, comments on health-related issues, remediation concerns, thermal treatment concerns, and legal and procedural issues.

General Comments

A commentor asked if a solution restricted to Times Beach could be completed by 1990, if the buildings at Times Beach could be removed by the summer or fall of 1988, and if the site could be returned to a natural state.

The timing of the cleanup of the structures and debris has been studied. It is considered cost-effective to clean up the structures and debris located in contaminated portions of the site following dioxin remediation. Since CERCLA remedial activities must be cost-effective, remediation of the structures and debris in contaminated portions of the site must be performed after dioxin remedial activities are completed. Structures and debris located in uncontaminated portions of Times Beach adjacent to Interstate 44 will be cleaned up in the initial phase of the project, prior to dioxin remediation. It is believed that the cleanup of soil at Times Beach could be completed within six years of issuance of a RCRA permit to conduct thermal treatment.

One commentor requested that he be allowed to purchase one or more of the buildings at the site.

Salvage of the buildings will be considered during design of the remedy for the structures and debris. If it is found to be cost-effective, salvage may be performed after testing has demonstrated that the buildings are free of contamination.

Several commentors asked if it would be safe to locate the incinerator at Times Beach, considering the site's location with respect to the highway, schools, local communities, and the city of St. Louis.

As discussed previously, EPA believes that the thermal treatment unit can be operated safely at Times Beach and that transport and material handling can be conducted in a manner that presents minimum risk to the public. The overall remedy is considered to be protective of human health and the environment.

EPA was asked if the down-time encountered with the EPA mobile incinerator during EPA tests in Denney Farm and the length of time that the incinerator was operated were concerns of EPA.

The incinerator operated at the Denney Farm site is a research unit that was not designed specifically for soils handling. Recent changes were made to the unit, such as the retrofitting of the unit with equipment that will increase the operating capacity and reduce downtime associated with maintenance of the air pollution equipment, that should significantly improve operation of the incinerator. It is anticipated that downtime for a unit at Times Beach would not exceed 30 percent of the available time.

A commentor asked if there was conclusive evidence regarding dioxin's risk acceptability. EPA was asked if the toxicity of dioxin to humans, apart from chloracne, has been demonstrated.

There is disagreement in the scientific community regarding the risks due to exposure to dioxin. The position of EPA is to take a conservative position to ensure that any error made in the assessment of risk was made on the side of safety. CDC has recently reaffirmed support of the 1984 health assessment that established the original action level for exposure to dioxin in a residential setting. There has been no scientific evidence presented to date that invalidates the 1984 assumptions or conclusions.

One commentor suggested that the Times Beach site should be treated as a residential area when selecting a basis for remediation and that the 20 ppb action level is inappropriate for such an area.

EPA believes that residential development of the site in the future is unlikely due to institutional controls and practical considerations involving the flood plain. EPA therefore believes that a non-residential level of concern represents a more suitable level to target remediation at the site.

EPA was asked if the TCDD at concentrations from 1 to 20 ppb at Times Beach that would be capped would be excavated and consolidated at one area of the site prior to capping.

The soils containing dioxin at concentrations from 1 to 20 ppb would be covered in place.

> **EPA was asked if only soils exceeding 20 ppb which are brought to Times Beach would be thermally treated. If some material transported to Times Beach were not thermally treated, the commentor questioned where the untreated soil would be placed.**

All soils brought to Times Beach from off-site would be thermally treated. Ash from the treatment process would be land disposed at Times Beach.

> **A commentor asked if a hazardous waste landfill constructed at Times Beach for disposal of ash and untreated soil would violate the Missouri Hazardous Waste Management Law.**

The landfill constructed at Times Beach for disposal of ash would not be a hazardous waste landfill. The landfill would be designed and constructed to accept non-hazardous solid waste, in accordance with state requirements. The ash from the thermal treatment process will undergo a delisting procedure so that this material can be disposed of as non-hazardous solid waste. Following delisting, the ash would be considered a non-hazardous solid waste which is suitable for disposal in a solid waste disposal facility. No disposal of untreated soil is included in the proposed remedy.

> **EPA was asked if the plan to protect an incinerator at Times Beach with spur levees was workable.**

The spur levees are presently being constructed to slow the velocity of flood waters across the site. A thermal treatment unit would be protected by a ring levee. The Corps of Engineers has evaluated the construction of such a levee and considers it to be workable.

> **A commentor asked about the environmental effects that might occur if a containment structure was built at Times Beach to store soil from other sites, and a flood occurred that damaged the structure and caused dioxin-contaminated soil to be released to the Meramec River.**

This risk is discussed in the Times Beach Feasibility Study and Proposed Plan.

EPA was asked if there was a threat to the municipal water supply from the TCDD-contaminated soil not exceeding 20 ppb that would be capped at the site.

On the basis of sampling, Times Beach has been determined to not represent a significant source of dioxin into the Meramec River. No dioxin has been detected in Meramec River water at waterworks intakes. The remedy selected for Times Beach will further reduce the threat of dioxin transport to the Meramec River, since soil remaining that contains dioxin in excess of 1 ppb would be capped.

A commentor asked if an in-depth traffic study would be conducted before a final proposal for site remediation would be selected.

A traffic study will be performed during the design phase of the project.

A commentor asked if there was a federal regulation which prohibited the altering of the natural flow of a waterway if it endangered another person's property. EPA was further asked if they were required to build a levee on the other side of the Meramec River away from Times Beach since levees were being constructed on the site.

The remedy will have minimal impacts on flood heights, so there is expected to be no significant impairment of property. The spur levees were constructed to reduce flooding velocities at the site if a flood occurred. There is no reason to build similar levees on the other side of the river since dioxin contamination is not known to exist there. Such construction would not be justifiable as a CERCLA expense.

A commentor proposed that the contaminated soil at Times Beach be left in-place, buildings be removed, and the site restored to a natural wetlands area. The commentor suggested that there would be nothing gained from incinerating the soil since the material did not present a significant risk to human health and that prolonging the cleanup would only aggravate the emotional trauma to the residents in the area.

The health and environmental risks due to dioxin at the site have been previously discussed. It is EPA's opinion that remedial actions must be undertaken at the site due to these risks and the objective of providing a suitable long-term remedy for the site.

Health Issues

> **A commentor suggested that the Proposed Plan overstates the threat to human health and the environment posed by the hazardous substances at Times Beach and that the basis for the 1 ppb action level developed by CDC for exposure to dioxin-contaminated soil in a residential setting substantially overestimated the health risks due to dioxin exposure. It was further suggested by the commentor that new information should cause the risk assessment for Times Beach to be changed.**

These comments have been responded to previously. CDC has recently reaffirmed its support of the 1984 health assessment.

> **It was suggested that the 20 ppb non-residential action level considered appropriate for the site overestimates the potential risk presented by the contaminated soil at the site. EPA was further asked why the Proposed Plan was not accompanied by a quantitative exposure measurement that would support the 20 ppb action level being considered for the site.**

The rationale for selection of the 20 ppb action level was given in documents attached to the Proposed Plan. Those documents include correspondence from ATSDR that evaluate the 20 ppb action level and its protectiveness of human health in a non-residential setting. The 20 ppb action level was established by EPA on the basis of recommendations from state and Federal health agencies and exposure data presented in the the feasibility study risk assessment.

> **EPA was asked if the classification of Times Beach as a non-residential site made the risks of human exposure to contaminants at the site from ingestion, inhalation, or direct contact insignificant.**

The risks quantified for non-residential use in the feasibility study were not insignificant. Health agency recommendations for nonresidential use indicate that concentrations of dioxin in soil represent a level of concern.

> **One commentor suggested that EPA's methodology for assessing cancer risks from TCDD is much more conservative than those of other regulatory agencies.**

EPA believes that its risk assessment procedures are appropriately conservative.

> **A commentor questioned whether new sampling data, combined with existing access restrictions, validated the no action alternative with at most a soil cap, as being the safest and most protective course of action for the site.**

New sampling data has confirmed previous data. The evaluation of remedial alternatives in the feasibility study and Proposed Plan remain valid as a result of this new data.

> **EPA was asked if it was necessary to place a clean soil cover over those areas contaminated with soil below the applicable level of concern. A commentor suggested that remediation of the areas between 1 and 20 ppb was unnecessary in a non-residential setting such as Times Beach.**

The soil cover provides protection of the environment and an additional barrier for protection of human health. The soil cover would effectively dilute any contaminated soil brought to the surface and would provide stability to prevent erosion and migration.

> **One commentor suggested that the proposed level of concern noted in the Proposed Plan for airborne TCDD and clean-up level for interior surfaces is inappropriately low.**

The level of concern is that which is recommended by federal and state health agencies. EPA believes the level to be appropriate and necessary to assure protection of health and the environment.

> **EPA was asked if the delisted ash from the incinerator, since the material would be nonhazardous, would best be utilized as backfill for excavated areas of Times Beach. It was suggested that this could be done by mixing the ash with clean, native soil.**

Once delisted, the ash would be considered a solid waste. The decision to land dispose the material will be made in accordance with state solid waste disposal requirements. The use of such material as backfill will be considered if such use is acceptable to the state.

> **EPA was asked why the Proposed Plan does not contain a quantification of the risks of on-site incineration.**

No dioxin was detected in the emissions or ash at the Denney Farm trial. It is therefore not possible to quantify risks due to exposure to such material. The safety risks from operation of an incinerator were evaluated qualitatively in the feasibility study and the Proposed Plan.

Remediation Issues

A commentor suggested that the Proposed Plan does not adequately address the in-place containment alternatives.

EPA believes that the feasibility study and the Proposed Plan provided adequate evaluation of the in-place containment alternatives.

One commentor questioned whether it was appropriate to include other sites for remediation at Times Beach since remedial investigations, feasibility studies, and site-specific risk assessments had not been conducted at those sites.

The decisions made for Times Beach and the Minker/Stout/Romaine Creek sites are based on previous studies. As discussed in the Proposed Plan, future decisions for other sites will be made independently on a site-by-site basis.

A commentor suggested that previous actions taken by EPA to remove contaminated soil from the Minker portion of the M/S/RC site were ill-advised and that actions at the Stout and Romaine Creek portions of the site are not justified based on the risks associated with the areas.

In making previous decisions regarding these response actions, EPA has determined that the actions taken at these sites meet CERCLA and NCP remedy selection criteria.

A commentor concurred with EPA that the best place to put a centralized thermal treatment facility was Times Beach.

As discussed previously, EPA believes that the siting of a centralized thermal treatment unit at Times Beach offers many important advantages over other areas.

EPA was asked why the incinerator at Times Beach could not be used to treat dioxin-contaminated soil from all of the sites in Missouri, rather than only those noted in the Proposed Plan.

Public participation is an important component of the CERCLA remedy selection process. The local community has expressed opposition to material being transported to Times Beach for treatment from other states, or other portions of Missouri. EPA has considered the position of the local community in proposing and selecting a remedial alternative.

The sites identified in the Proposed Plan are related to waste oil spraying conducted by the Bliss Waste Oil Company in the early 1970's. EPA considered public comments on bringing additional material to Times Beach and concluded that contaminated materials from other locations not identified in the Proposed Plan would not be brought to Times Beach for incineration.

> **One commentor suggested that there was no rationale to excavate or incinerate dioxin-contaminated material from any of the confirmed dioxin sites in the state.**

Future decisions regarding response actions at the other sites will be made on a site-by-site basis, as noted in the Proposed Plan.

> **EPA was asked to explain why the Erxleben site was not included and the Bristol Steel site was included with the sites listed in the Proposed Plan for thermal treatment at Times Beach.**

Recent comprehensive sampling by EPA at the Erxleben site did not detect contaminant levels exceeding a level of concern for protection of public health and the environment. Bristol Steel has been included due to the reported detection of dioxin in that property by the current site owner. This dioxin is believed to be present on the property due to the spraying of waste oil on the property by the Bliss Waste Oil Company in the 1970's.

> **EPA was asked what levels of concern would be achieved following excavation of the soil volumes for the sites listed in the Proposed Plan. EPA was also asked whether excavation of the volumes listed would enable the State to remove each site from the Missouri dioxin registry.**

Future excavation decisions are not being made at this time. The volumes estimated for these sites assume that the residential sites are cleaned to 1 ppb surface concentration and 10 ppb below 1 foot depth and that commercial or industrial areas are cleaned to an action level of 20 ppb. The State is evaluating whether these sites can be removed from the State registry if these cleanup levels are achieved.

> **One commentor suggested that the tables in the Proposed Plan listing soil volumes be updated when new information became available and be restricted to dioxin-contaminated soil volumes only.**

The projected soil volumes are continually updated as new data becomes available. Non-dioxin contamination is excluded from the list.

> **EPA was asked whether it was lawful or appropriate to use Superfund money to remove or destroy uncontaminated structures and debris at the Times Beach site.**

EPA believes that it is lawful and appropriate to clean up structures and debris at Times Beach as a completion of the permanent relocation that was announced in 1983.

> **EPA was asked if there was sufficient borrow on the site to construct a cap for the areas with dioxin contamination between 1 and 20 ppb or if offsite borrow would have to be obtained at a premium cost.**

Sufficient borrow has been identified onsite or immediately adjacent to the site by the Corps of Engineers for construction of the soil cover. Acquisition of high-cost borrow material will not be required.

> **EPA was asked if the construction of a a one-foot layer of soil over the 1 to 20 ppb soil areas would create a "rice paddy" effect, with water ponding between the covered street areas.**

Design and construction of the soil cover would include provisions for drainage to eliminate the problem. Alternative methods of providing a one foot clean soil layer will be evaluated during design.

> **EPA was asked if a deep tillage/soil inversion technique could be used instead of the one-foot soil cover to achieve remediation in the areas between 1 and 20 ppb.**

This particular technique shows merit and will be evaluated during the design phase for the remedial action.

> **One commentor expressed concern that clean soil placed on paved areas would lack stability and could erode. It was suggested that soil inversion could be used instead for the paved areas.**

A soil cover placed over paved areas would be vegetated to minimize erosion. A soil cover over paved areas would be less affected by instability and erosion than would a soil cover over an impermeable membrane (alternative 2) since the pavement is generally in a deteriorated state and some degree of infiltration would be possible, and because the pavement width is generally much narrower than would be the width of a membrane covering contaminated areas. Soil inversion as a potential method of providing a one-foot clean soil layer will be evaluated during design.

> **EPA was asked if a RCRA equivalent cap is technically proper and economically justified. The commentor suggested that such a cap would not be appropriate for the site considering the nature of the contamination and that only a vegetative cover is required.**

EPA evaluated construction of a RCRA equivalent cap and is not proposing that such a cap design be used. A vegetated soil cap is a component of the proposed remedy.

> **EPA was asked if long term maintenance or monitoring was required after the site had been remediated. The commentor suggested that such maintenance or monitoring would not be required.**

Federal health agencies have advised EPA that the proposed cleanup is protective of human health, and that following completion, no further follow-up testing or monitoring would be necessary, except in the event of widespread soil disturbance. Periodic inpections would be required to assure that future land use remains consistent with the cleanup, and to note any areas of widespread soil disturbance.

The proposed cleanup would result in soils remaining on site which could potentially impact the environment through migration and bioaccumulation, although environmental impairment has not been observed to date. Periodic surveillance to detect eroding areas or areas of soil disturbance is required to provide an additional measure of protection for public health, and to assure the continued protection of the environment. At their election, local authorities could arrange for independent monitoring.

Maintenance would consist of performing necessary repairs to eroding or disturbed areas. As noted in the Proposed Plan, the continued integrity of the soil cover is not critical to assure protection of public health, since contaminated soils which exceed health-based levels will be removed.

> **A commentor suggested that the interior cleanup level noted in the Proposed Plan was too low. The commentor suggested that the interior cleanup level of 4 picograms per square meter applies to residences that will be reinhabited and not to those that will be demolished. It was suggested that further sampling of the structures was not needed.**

Testing will be required prior to disposal of structures and debris to confirm that the material is free of contamination and can be disposed of as a non-hazardous solid waste. Decontamination will be required if dioxin is detected.

> **EPA was asked if the remediation of the city park would be considered as a totally separate endeavor. It was suggested by the commentor that the remediation should be performed in a manner consistent with the rest of the site.**

As discussed in the Proposed Plan, the contamination in the city park is independent and unrelated to the dioxin contamination. It is considered appropriate to evaluate and proceed with remediation of this area independently. Due to the relative magnitude of the dioxin cleanup, the non-dioxin evaluation should not delay implementation of remedial measures.

Thermal Treatment Issues

> **A commentor suggested that the Proposed Plan is weighted in favor of on-site incineration since the plan considers the treatment of other sites at Times Beach. The commentor suggested that the additional volume of material creates a bias against other alternatives such as on-site containment or storage.**

EPA believes that it is appropriate to consider the potential need for response at other eastern Missouri dioxin sites in the remedy selection process for Times Beach. The sites listed in the Proposed Plan are related in the sense that all became contaminated as a result of the direct or indirect application of dioxin contaminated waste oil in the early 1970's by the Bliss Waste Oil Company. The remedy selected now for Times Beach will impact the future availability of management capacity for the other sites. EPA is seeking a cost-effective, comprehensive approach for addressing response requirements at each site. It is therefore appropriate to select a remedy for Times Beach in consideration of the potential future need for management of the soils from the other sites.

EPA was asked if a better location for a thermal treatment unit would be the area bounded by the Dogwood, Orchid, Grove, and Dahlia streets.

The location of the thermal treatment unit will be determined during design. As stated previously, the proposed location in the northwest portion of the site minimizes flood height impact and visibility. The final location will be determined in coordination with the local community.

EPA was asked if the incineration schedule appearing in the Proposed Plan was realistic, considering the time required for planning, design, fabrication, site preparation, and other activities, as well as contingencies for unforeseen difficulties.

EPA believes that the schedule appearing in the Proposed Plan is reasonable and can be met barring unforeseen delays.

EPA was asked if delisting criteria comparable to those prescribed by the 1985 exclusion would be imposed in the future.

Ash from the thermal treatment process must be formally delisted through the same process required in 1985 for delisting of residue at the Denney Farm site.

Procedural and Legal Issues

A commentor suggested that EPA is soliciting public comments on the Proposed Plan without having informed the public of EPA's response to public comments on remedial alternatives described in the feasibility studies. The commentor further suggested that EPA has not explained its rationale for abandoning alternatives from the feasibility studies and selecting new alternatives in the Proposed Plan.

EPA is not required to publish a responsiveness summary prior to the release of the Record of Decision. Treatment and containment alternatives in the feasibility study that potentially achieved CERCLA remedy selection criteria were selected and developed further in the Proposed Plan.

Alternatives which were evaluated in the Proposed Plan were determined by identifying remedial alternatives evaluated during the remedial planning process which satisfied CERCLA remedy selection criteria to the greatest extent, and developing them further to address the goals of the cleanup.

> **One commentor suggested that the Proposed Plan contained two capping alternatives that had not been included in the feasibility study. The commentor suggested that CERCLA requires that states be afforded the opportunity to comment on the planned remedial action described in the feasibility study.**

An opportunity for the state to comment on the two capping alternatives in the Proposed Plan was provided during the public comment period.

> **EPA was asked why it had not explained the Agency's plans for remedial action at Times Beach were changed after the permanent relocation was performed and a January 1984 ROD signed.**

The permanent relocation and 1984 Record of Decision, including the subsequent cancellation of the Interim Storage Facility project, were described in the feasibility study and Proposed Plan. Both of these documents were released for public comment.

> **EPA was asked why a no action alternative was not included or comprehensively evaluated in the Proposed Plan.**

The no action alternative was evaluated in the feasibility study and eliminated from further consideration by EPA prior to the Proposed Plan. As discussed previously, EPA does not consider the no action alternative to present a suitable long-term remedy for the site.

> **One commentor suggested that the public comment period for the Proposed Plan was unreasonably short. The commentor further suggested that comments received by EPA could only receive a cursory review and consideration if a ROD is to be issued by March 31, 1988.**

The public comment period satisfies the statutory and regulatory requirements under CERCLA and was adequately long. All comments received during the comment period are being considered prior to remedy selection and addressed in the responsiveness summary.

> **EPA was asked if the Times Beach site should never have been listed on the National Priorities List (NPL) since the original listing in 1983 was based on an alleged groundwater threat at the site. The feasibility study and Proposed Plan both have ruled out dioxin movement to groundwater as being a significant threat.**

The Times Beach site was listed on the NPL as a result of a valid ranking using the Hazard Ranking System (HRS). This ranking remains valid, and inclusion on the NPL is considered appropriate.

> **EPA was asked if a delisting petition would be needed for disposal of incinerator residues from other Missouri dioxin sites if all of the sites in Missouri were treated as a single site.**

A single delisting procedure will be required for residue from treatment of soil from all potential locations identified in the Proposed Plan.

> **One commentor stated that the dioxin contamination at Times Beach presents no significant risk to human health, and that the proposed incineration will only generate additional wastes and prolong the cleanup which will aggravate the emotional trauma of the residents. The commentor suggested allowing natural processes to remedy the problem, leaving the soil in place, removing structures, and restoring the site to a natural wetlands area. The commentor stated that the dioxin contamination will not migrate from the site, and is not absorbed by vegetation. The commentor stated that dioxin on the surface of the soil has been detoxified by ultraviolet light. A number of studies were cited which draw varying conclusions on the human health hazard represented by dioxin.**

As stated previously, the cleanup level established for Times Beach is based upon recommendations from state and federal health agencies. A risk assessment was performed in 1984 by Kimbrough et al. which formed the basis for these recommendations. CDC has recently reaffirmed its support of the assumptions and conclusions presented in the 1984 study.

Thermal treatment of contaminated soils results in the destruction of dioxin to undetectable levels. Once delisted, this material can be disposed of as a non-hazardous solid waste. On the basis of experience with thermal treatment of soils in southwest Missouri, EPA believes that delisting of the treatment residue will be achievable. Thermal treatment therefore converts a hazardous waste material to a non-hazardous waste material which represents no significant risk to public health and the environment.

There will be short-term onsite construction activities associated with implementation of the remedy. It is estimated that the project can be completed within six years. It has been determined that the proposed remedy will provide greater short- and long-term protection of public health and the environment by destroying dioxin contamination in a safe manner than would be achieved by no action. Allowing the contamination to remain in-place represents an unacceptable risk to public health and the environment. The long-term economic welfare of the community is also expected to be substantially improved by implementation of the proposed remedy.

Ultraviolet degradation of dioxin in surficial soils has not been demonstrated to reduce contaminant levels to the extent necessary for protection of human health and the environment in a reasonable time frame. Surface concentrations as high as 1600 parts per billion (ppb) have recently been detected at Times Beach, which exceeds the highest levels detected during extensive sampling conducted from 1982-1984. It is not apparent that surface dioxin levels are being substantially reduced. Ultraviolet exposure has also not been effective at degrading surficial dioxin at the nearby Castlewood site, where levels as high as 60 ppb have been detected in dust samples collected from street sweepings. Even if ultraviolet exposure was determined to be effective at degrading surficial dioxin contamination, dioxin levels immediately beneath the surface would be unaffected and would continue to represent an unacceptable risk to public health and the environment.

Sampling of offsite sediment and biota has not indicated that a substantial amount of dioxin-contaminated soil is migrating from Times Beach. Analysis of ground water samples collected directly onsite has not detected the presence of dioxin. However, it is conceivable that some degree of contaminant migration is occurring from Times Beach, particularly during flood events. The proposed remedy and completion of the spur levee project will control the potential for offsite migration of dioxin from Times Beach.

Dioxin uptake in plant life is uncertain. Although dioxin uptake in vegetation appears to be insignificant, the literature does contain conflicting reports. Dioxin uptake by wildlife onsite, however, can occur regardless of dioxin content of vegetation. Animals are susceptible to dioxin uptake through conventional pathways including ingestion, inhalation and direct contact. Dioxin contamination has been detected in biota samples collected from Times Beach.

The literature contains a number of human health studies which draw conflicting conclusions. A number of these studies were cited by the commentor. The commentor states that "of greatest significance is the study performed on 104 residents of Times Beach" conducted by CDC, Missouri Division of Health, St. Louis University, and St. Joseph's Hospital. This article actually states:

> "The results appear negative, but no overall definitive conclusion should be based solely on this initial study."

The article further states:

> "Public health policy in situations such as this environmental contamination with TCDD must continue to focus on the prevention of any potential health effects (particularly delayed or long-term), even if effects are not demonstrated in a pilot study. For this reason appropriate efforts to prevent human exposure must continue, in this and other similar situations, until a more complete understanding of public health risks is obtained."

In 1986, the Centers for Disease Control provided to Congress a "Detailed Response to Subcommittee Questions on Dioxin." In their response to a question on the current extent of knowledge concerning the human health effects, CDC stated that:

> "A number of epidemiology studies and health assessments in humans have given negative results. For various reasons, the results of these negative studies are not convincing, particularly because of the overriding effects of confounding variables."

CDC further states that:

> "The lack of definitive human data forces the use of animal data for predicting possible human health effects."

and:

> "... in the absence of useful human data to the contrary, prudent public health policy dictates an assumption that humans could suffer effects similar to those observed in animals and that preventive public health policy must be based on available animal data."

The 1984 risk assessment which supports the recommendations for cleanup levels at Times Beach is based upon animal health studies. This assessment has been consistently applied during the cleanup of dioxin sites in Missouri, and remains valid for remediation of the Times Beach site.

COMMENTS RECEIVED FROM THE STATE OF MISSOURI

Comments on the Proposed Plan were received from the Missouri Department of Natural Resources (DNR). These comments and the corresponding EPA responses are included in this section.

> **DNR believes incineration has been demonstrated to be a safe and effective method for destroying dioxin. EPA's proposed plan meets the state objective of offering a long-term permanent solution to the dioxin problem.**

EPA agrees that thermal treatment is safe and effective at destroying dioxin contamination.

> **DNR believes that consideration of the opinions and reaction of local residents, as well as experts, is integral to the decision-making process.**

Public participation is an important component of the remedy selection process under CERCLA, as amended. The CERCLA requirements for public involvement have been met or exceeded during the remedy selection process for Times Beach and Minker/Stout/Romaine Creek. All comments received from the public have been considered in the selecting a remedy for Times Beach and the Minker/Stout/Romaine Creek sites. All such comments received are included in this responsiveness summary with a corresponding explanation of how each comment was addressed in the remedy selection process.

> **The State commented that their support for the facility is dependent upon EPA's execution of a legally enforceable document with the state and surrounding communities that assures:**
>
> - **Design and construction of a solid waste landfill for the debris at Times Beach will commence immediately, and debris removal will begin when the facility can accept waste**
> - **A termination date for incineration at Times Beach**
> - **A limitation on the number of sites and/or volume of material to be treated at Times Beach**
> - **An agreement to transport contaminated material only during non-peak hours**

- **Availability of a technical assistance grant to the surrounding community for the purpose of independent monitoring of the project**

Section 121(e)(2) of CERCLA provides in pertinent part that: "a State may enforce any Federal or State standard, requirement, criteria, or limitation to which the remedial action is required to conform under this Act in the United States district court for the district in which the facility is located . . ." Also, both RCRA and CERCLA have citizen suit provisions at Section 7002 of RCRA and Section 310 of CERCLA. Section 121(d)(3) of CERCLA provides in pertinent part that: "In case of any removal or remedial action involving the transfer of any hazardous substance or pollutant or contaminant offsite, such hazardous substance or pollutant or contaminant shall only be transferred to a facility which is operating in compliance with section 3004 and 3005 of the Solid Waste Disposal Act (or, where applicable, in compliance with the Toxic Substances Control Act or other applicable Federal law) and all applicable State requirements . . . ."

The thermal treatment unit to be located at Times Beach will need to be permitted under RCRA because hazardous substances from other sites will be brought to Times Beach for treatment. The State is expected to limit the duration of the permit to a fixed term of six years. The fixed term duration of the permit would be enforcible by the state and citizen suit.

The ROD states that design and preparations for award of a contract for the cleanup of the structures and debris in uncontaminated portions of the site will begin immediately upon ROD signature. These specific areas, which generally include the most highly visible area adjacent to Interstate 44, are defined in the ROD.

Cleanup of the dioxin-contaminated soil must be completed prior to disposal of structures and debris in contaminated portions of the site, due to the requirement that all remedies implemented under CERCLA authority must be cost-effective. Performing the demolition and disposal activities while still in contaminated areas would substantially increase the cost of the project due to the need for protective equipment, decontamination requirements, and other precautions which must be taken when working in contaminated areas. Disposal of structures and debris in these areas will be initiated immediately upon removal of contaminated soils.

The ROD defines the limitations on the number of potential sources of soil to be treated at Times Beach. These sources are listed in Table 1 of the ROD. The ROD also limits the duration of the project to six years after receipt of a permit from the state for the thermal treatment unit. The duration of a permit issued for thermal treatment under RCRA is limited by federal regulations to ten years (40 CFR 270.50). EPA will seek a permit for operation of the thermal treatment unit which is limited to a period not to exceed six years.

As described in the Record of Decision, a detailed transportation plan will be developed prior to design which will specify safety precautions to be implemented during transport, including use of non-peak hours only. Other precautions which will be evaluated include selection of transportation routes, safety contingency plans, continuous radio communication, and use of escort vehicles. The transportation plan will be developed in coordination with local officials to assure that the concerns of the impacted communities are addressed.

Technical assistance grants of up to $50,000 are available to qualifying citizen's groups for the purpose of obtaining assistance in interpreting information related to cleanups at Superfund sites. Over 1000 Information packages containing a fact sheet and federal register notice describing the availability of these technical assistance grants were mailed to identified interested parties, including local officials and citizens, in late March, 1988. EPA would support an application for a grant to the local community in order to assure effective public participation in the design and implementation of the remedy.

The State opposes transport of any material to Times Beach from sites located outside Missouri.

As stated in the Proposed Plan and Record of Decision, only dioxin-contaminated materials from designated locations will be transported to Times Beach for treatment. Under no circumstances would EPA consider transport of out-of-state wastes to Times Beach for management. The state-issued permit for the thermal treatment unit will also limit the sources of material which can be accepted at Times Beach.

The State commented that since protection of the soil cover was an integral component of the in-place containment alternatives, the degree of required maintenance and protection for the soil cover in the proposed remedy is unclear.

For in-place containment alternatives, the cap or cover represents the primary means of protection of human health and the environment. Any breech in the cap or cover would expose soil contaminated in excess of health-based levels. The continued integrity of the cap is therefore critical to assure the continued effectiveness of in-place containment remedies.

The proposed remedy does not constitute an in-place containment alternative. The proposed remedy includes excavation and treatment of all soils exceeding a level of concern for protection of human health. The soil layer represents an additional measure of protection, and a means to control potential offsite migration and environmental exposure to residual contaminant levels. Although this potential exposure is of concern due to the possibility for the process of bioaccumulation to occur, previous testing of Meramec River sediment and biota has not determined that Times Beach is a significant source of dioxin contamination in the river. Maintenance of the soil cover is therefore not critical to the continued effectiveness of the proposed remedy, and monitoring and maintenance requirements are less stringent than for in-place containment alternatives. This determination is stated in the Record of Decision.

The degree of monitoring and maintenance typically associated with a public park is adequate for the soil cover included in the proposed remedy. An appropriate program would include periodic surveillance, and stabilization through sodding, reseeding, or other means, of any areas exhibiting significant erosion. Isolated breeches in the soil cover would not be of concern, since adequate protection is achieved by removal of contaminated soil.

The State requested clarification of the types of land use restrictions which would be required following implementation of the proposed remedy.

Land use restrictions will be required to ensure that future land use remains consistent with the proposed remedy. The four-party agreement for the permanent relocation of residents and businesses at Times Beach includes provisions which require that state and federal health agencies must concur with any proposed use of the site following the cleanup. The State Registry of Confirmed Uncontrolled or Abandoned Hazardous Waste Disposal Sites also controls future land use at Times Beach. Additional deed restrictions or local zoning ordinances may be implemented to ensure that land use remains consistent with the level of cleanup and local interests.

As noted in the Proposed Plan and Record of Decision, the contamination at Times Beach is present along certain specific roadways representing a relatively small portion of the entire site. Only 2 percent of the entire site area currently exceeds 20 ppb. Continuing land use restrictions will not be necessary for all portions of the site following the cleanup. It is possible than that different land uses may be allowable in the future in different areas if the appropriate health-based criteria are not exceeded. For example, following the cleanup, a large portion of the site will actually achieve residential cleanup criteria, although residential development is considered unlikely, even if acceptable to State and Federal health agencies, due to the frequent flooding of the Meramec River.

Residential land use is an example of a type of usage which would not be allowable in certain portions of Times Beach following the cleanup. It is not possible to define every conceivable type of land use which would not be appropriate for Times Beach. Decisions regarding allowable future use must be made on a case-by-case basis in consideration of exposure potential. The existing institutional controls provide an effective mechanism for assuring that future land use remains acceptable to State and Federal health agencies, by requiring their concurrence on proposed land use changes.

> **The State believes that EPA should commit to a review of the remedy every 5 years, as provided by Section 121 of the Superfund Amendments and Reauthorization Act of 1986 (SARA).**

According to section 121 of SARA, a review of the effectiveness of the remedy is required no less often than every 5 years for remedial actions which result in hazardous substances remaining at the site. The intent of Congress in requiring such review was to assure the continued effectiveness of containment remedies. EPA interprets this requirement to apply to remedial actions which result in hazardous substances remaining at the site at concentrations exceeding health-based levels for unrestricted use.

The degree of cleanup proposed for Times Beach corresponds to a specified non-residential land use. Protection of human health is assured by existing institutional controls which place restrictions on future land use at the site. The continued effectiveness of the remedy is therefore dependent on the ability of these institutional controls to restrict future land use to that consistent with the degree of cleanup. A five year review will be conducted as a component of the proposed remedy.
In the event that additional information regarding the toxicity, mobility, or other characteristic of dioxin is discovered at a future date, CERCLA allows for a re-evaluation of the remedy in consideration of the new information. Section 121 of SARA requires EPA to take action if it is determined that additional response is necessary to protect human health and the environment.

> **The State requested an explanation of the reason that the decision to transport the dioxin-contaminated soil currently in storage at the Quail Run and Castlewood sites is not included in the**

Record of Decision for the Times Beach and Minker/Stout/Romaine Creek sites.

The National Contingency Plan (50 FR 224, November 20, 1985) establishes procedures for remedy selection and expenditure of Superfund moneys. These regulations differentiate between response actions that can be taken at sites appearing on the NPL and those sites not on the NPL. The response that is proposed for Times Beach and Minker/Stout/Romaine Creek, both NPL sites, is a remedial action, which can only be conducted at sites appearing on the NPL. Since Quail Run and Castlewood do not appear on the NPL, they are not eligible for remedial actions, and must instead be responded to under the removal authority of CERCLA, as defined by the NCP. Response actions to be implemented at Quail Run, Castlewood, and the other non-NPL sites designated in the Proposed Plan and Record of Decision for Times Beach and Minker/Stout/Romaine Creek will be conducted as removal actions which are selected by a decision document called an Action Memorandum. The state is not required to provide matching funds for a removal action, which is a primary difference between removal actions and remedial actions.

EPA has recognized the need for immediate response at the Quail Run and Minker/Stout/Romaine Creek site by conducting removal actions for excavation and containment of dioxin-contaminated soils at both sites. The potential for migration and exposure has been controlled by these actions. These response actions are interim actions, and EPA does not intend to defer final action at these two sites. The excavated material in storage at Quail Run and Castlewood will be important in minimizing down-time of the thermal treatment unit by allowing continual operation during periods when excavated soil is not available from other sites due to weather or other interference. For this reason, decisions regarding final management of this material must be made in the early phases of the project.

The State requested EPA to consider removing soils at Times Beach exceeding 10 ppb in order to reduce the number of land use restrictions necessary for Times Beach, and expand the range of potential uses for the site following clean up. The State would not propose using Times Beach for residential purposes due to floodplain restrictions.

An action level of 20 ppb has been established for Times Beach on the basis of recommendations from the Agency for Toxic Substances and Disease Registry (ATSDR). As an additional measure of protection, a one-foot layer of clean soil will be placed over all areas exceeding 1 ppb. This level of cleanup will assure protection of human health for anticipated future uses of the site. Removal of soil between 10 and 20 ppb is not necessary for the protection of human health and the environment, and therefore does not represent a justified use of Superfund money.

The level of cleanup proposed for Times Beach will not unduly restrict potential future uses of the site. EPA agrees that future residential use is not feasible due to the frequent flooding which occurs. Most non-residential uses of the site would not be restricted. Certain types of agricultural use would not be allowed following the proposed cleanup; however, these agricultural uses would also be restricted if soils exceeding 10 ppb were removed. Removal of soils exceeding 10 ppb would not enable broader use of the site than would be allowed by the proposed cleanup, due to use restrictions resulting from the frequent flooding of the Meramec. Floodplain restrictions will have paramount control over future land use, and will not be affected by lowering the cleanup level.

> **The State commented that the ATSDR advisory concludes that a 33 fg/kg b.w./day dosage corresponds to commercial exposure where only 10% of the site is contaminated at 20 ppb.**

In correspondence of July 30, 1987, from ATSDR to EPA, the rationale for a 20 ppb action level at commercial settings was explained. The average lifetime daily dose was reduced by a factor of 10 since it was assumed that only one-tenth of the site was contaminated at 20 ppb.

In the case of Times Beach, it is appropriate to factor this reduction in the calculation of average lifetime daily dose because only a portion of the entire site is contaminated. Recent testing has concluded that actually only 2 percent of the entire 480 acre site is contaminated at levels exceeding 20 ppb. Therefore, following the proposed cleanup, only 2 percent of the site will have a residual level of 20 ppb dioxin. The assumption that 10 percent of the site is contaminated at 20 ppb is therefore conservative, and results in an overestimation of the average lifetime daily dose that could actually occur following the cleanup.

It should be noted that the 1984 assessment by the CDC reported a range of average lifetime daily doses corresponding to a 1/1,000,000 added cancer risk of 28 to 1428 fg/kg b.w./d. This study reported that "the best estimate of a daily dose at 1 ppb in residential soil (assuming uniform distribution of TCDD in soil at 1 ppb) is calculated to be 44.6 fg/d (or 636.5 fg/kg b.w./d for a person weighing 70 kg)." Because of the range of the estimated Virtually Safe Dosage (VSD) and the unlikelihood that all of the conservative assumptions will be realized, the authors concluded that residential soil levels greater than 1 ppb pose a level of concern. Therefore, even if 100 percent of a commercial site is contaminated at 20 ppb, the calculated lifetime average daily dose of 330 fg/kg b.w./d is approximately half of the calculated lifetime average daily dose for residential soils contaminated at 1 ppb.

> **The State commented that on-site disposal [of non-hazardous solid waste] will have to comply with the Missouri Solid Waste Management Law and Regulations, in addition to RCRA Subtitle D requirements, and that any onsite landfill must be flood-protected.**

The Record of Decision for Times Beach will specify that on-site disposal will be conducted in accordance with the Missouri Solid Waste Management Law and Regulations. Also, landfills constructed on site will be protected from flooding using appropriate measures to ensure that floodwater does not contact solid waste.

> **The State commented that the ARARs discussed in the Times Beach Feasibility Study for air pollution control should be included in the Proposed Plan and Record of Decision.**

As described in the feasibility study, ARARs associated with air pollution control include provisions of the Clean Air Act, which is currently administered by MDNR. Provisions of the Clean Air Act which have been delegated to St. Louis County would also be considered ARARs.

RCRA performance standards are generally more stringent than new source performance standards under the Clean Air Act. Emissions of some of the more conventional pollutants are not addressed by RCRA. Emissions of these conventional pollutants are regulated by the Clean Air Act.

> **The State advised EPA that they are planning to develop an air toxics program in the near future which will be more stringent than federal requirements.**

The Proposed Plan and Record of Decision can not evaluate requirements which do not yet exist. The Record of Decision evaluates all identified ARARs currently in existence. Newly established requirements which represent potential ARARs will be evaluated for impact on the proposed remedy when they are published or otherwise provided to EPA.

> **The State commented that the discussion of Missouri Water Quality Criteria is incorrect.**

The State has adopted numerical water quality standards for dioxin under the Missouri Clean Water Law (10 CSR 20-7.031). The standard for protection of human health is 0.00013 nanograms per liter (ng/l). The standard for protection of aquatic life is 0.000014 ng/l. These standards are below analytical detection limits and apply primarily to discharges with detectable dioxin levels. The criteria are compared to the discharge concentration divided by a dilution factor calculated from the flowrate of the receiving river. If dioxin can not be detected in the discharge, the standards have no application. None of the alternatives evaluated in the Proposed Plan or Record of Decision involves discharge into waters of the State. Therefore, Missouri water quality criteria do not constitute ARARs for this remedy selection.

The State recommends land application of wastewater at or below "consumptive rates". If consumptive rates are exceeded, an NPDES permit would be required for discharge into the Meramec River.

The State recently published regulations concerning land application which are expected to become effective prior to implementation of the selected remedy. These regulations require a State Operating Permit for land application of industrial wastewater. This permit is similar to an NPDES permit, which would be required if wastewater were discharged directly into the Meramec River or land applied at a rate exceeding the infiltration capacity of the ground. An engineering report must be prepared in order to obtain a State Operating Permit which demonstrates the acceptability of the proposed discharge.

The State commented that wastewater must be delisted prior to land application.

All residue from the thermal treatment unit must be delistable, including wastewater and treatment residue (ash). If these materials are not delistable, they must be managed as a hazardous waste, which would invalidate the cost-effectiveness of the proposed remedy.

The State commented that an Operating Solid Waste Disposal Area Permit will be required from MDNR, in addition to any local approvals for onsite land disposal.

As explained in the Proposed Plan and Record of Decision, onsite land disposal of non-hazardous solid waste will be performed in compliance with provisions of the Missouri Solid Waste Management Law. For onsite actions, CERCLA exempts EPA from the requirement to obtain permits, however all substantive provisions of the permitting regulations must be met.

Delisted residue resulting from the thermal treatment of a hazardous waste is considered a newly generated onsite solid waste. This is true for residue resulting from treatment of both onsite and offsite hazardous wastes. The onsite disposal of this material constitutes an onsite action, and exempt under CERCLA, as amended, from administrative permitting requirements, which includes the need to actually obtain the permit itself. All substantive permitting requirements must still be met. Despite the exemption from administrative permitting requirements for onsite actions, EPA will seek a permit from the State for land disposal of delisted residue from the thermal treatment process in order to assure the State and public that the disposal will be implemented safely. All administrative and substantive state permitting requirements will be achieved prior to disposal.

The disposal of structures and debris located onsite at Times Beach also constitutes an onsite action, and is exempt from administrative permitting requirements. This material will be disposed of in accordance with all substantive state permitting requirements. The exemption from administrative permitting requirements will enable EPA to immediately initiate design and construction of the disposal facility for the disposal of onsite structures and debris following remedy selection, with no permitting delays.

Local approvals are generally not considered ARARs, unless they are delegations of state or federal programs. St. Louis County Clean Air Requirements are an example of a state-delegated program. Since local solid waste disposal requirements are not delegations of State or Federal programs, EPA is not required to obtain local approval prior to disposal. EPA will coordinate the design and construction of the disposal unit(s) to ensure that the substantive requirements are met.

The State clarified the definition of a "special waste" as "any solid waste requiring handling other than normal use municipal waste".

This definition of a special waste will be incorporated into the Record of Decision.

The State commented that a statement in the Proposed Plan could be interpreted to imply that areas left at 20 ppb may not be covered with one foot of clean soil.

All areas within Times Beach exceeding 1 ppb, but less than 20 ppb, will be covered with a minimum of one foot of clean soil. All areas contaminated at 20 ppb or greater will be excavated until cleanup criteria is achieved, and backfilled with at least one foot of clean soil, or to original grade where excavation exceeds one foot.

The State suggested that locating the thermal treatment unit further from the railroad may be more acceptable to Eureka.

EPA has evaluated locating the thermal treatment unit in the northwest portion of Times Beach in order to minimize the impact on upstream and downstream flood heights and reduce visibility from the interstate highway. This area is also largely uncontaminated, which would reduce the volume of soil which would require removal prior to construction of the ring levee. EPA has no intention of using the railroad to transport hazardous waste to Times Beach for treatment.

The final location for the thermal treatment unit will be determined during the design phase. EPA would not object to locating the thermal treatment unit in another portion of Times Beach, if the proposed area would not require removal of an excessive volume of contaminated soil prior to construction, and would not significantly impact upstream or downstream flood heights. The local communities will be given the opportunity to participate in selection of a location for implementation of the project.

> **The State commented that a RCRA Part B permit will be required prior to construction of any facility required to obtain such a permit.**

EPA agrees that a RCRA Part B permit for treatment of offsite material will be required prior to construction. This will be clarified in the Record of Decision.

> **The State commented that implying that a petition is required to change land use for a property on the Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites may be overstating the process. Only a request to the department director is required, and the use change does not have to be acceptable to federal health agencies.**

The language in the Record of Decision will be modified to state that the director must approve a request to change the use of a site appearing on the state registry.

SECTION 2

TIMES BEACH FEASIBILITY STUDY

This section summarizes comments received during the public meeting held February 12, 1987, and the comments received subsequent to the meeting, in response to the report titled Public Comment Draft Feasibility Study for the Times Beach site, Times Beach, Missouri.

QUESTIONS

At the meeting, there were several questions regarding the cleanup and proposed alternatives.

> **Concern was expressed about the proximity of decontamination facilities at the site to homes, the stirring up of TCDD-contaminated material during remedial activities, and accidents that might occur during the remediation.**

EPA shares these concerns and intends to take measures to prevent exposure of local citizens and site workers to the contaminated soil. Although a thermal treatment operation was conceptually described in the feasibility study, no formal decisions have been made about the location of a thermal treatment unit or support facilities at the site. During planning and implementation of the remedial activities, safety measures will be considered to minimize the risk of dioxin exposure to the local population. The measures will include onsite and offsite air monitoring. The location of decontamination facilities, safety measures required to prevent accidents, and site monitoring plan will be developed during the planning phase.

> **Several people expressed support for an alternative remedial approach that would entail capping of the contaminated soil with an impermeable membrane, placement of a clean soil cover over the membrane, and landscaping and fencing of the site.**

At the request of those proposing this remedy, an alternative was evaluated in the Proposed Plan consisting of placement of an impermeable barrier and soil cover over contaminated areas. The guidelines for selection of remedies at sites is provided by CERCLA, as amended by the Superfund Amendments and

Reauthorization Act of 1986 (SARA). EPA believes that the approach of capping the site, while technically viable, does not meet the requirements of CERCLA, as amended, to the same extent as thermal treatment of the contaminated soil. Capping does not attain all identified ARARs, is less protective, and does not satisfy the SARA preference for permanent remedies or remedies involving treatment of wastes. Thermal treatment has also been determined to be more cost-effective than capping alternatives.

> **A commentor asked about plans to open the South outer road to improve access to the highway system.**

Following completion of the remedy at Times Beach, EPA will not object to reopening the south outer road to through traffic, if acceptable to federal and state agencies.

> **One person asked about the possibility that the project could be started and then funds would run out.**

Although it is not possible to foresee all possible future events regarding funding for the various government projects, EPA is confident that adequate funding will be available over the duration of the project.

> **One commentor, who wished to cut some wood at Times Beach, expressed frustration at the requirements that were placed on such an activity. The commentor emphasized that these standards should not be less than what EPA itself must follow at the site.**

EPA believes that special requirements must be placed on certain activities at Times Beach to prevent contact with TCDD-contaminated soil by persons onsite or offsite. These measures have been implemented to protect the health of the public and must be enforced. EPA follows very strict procedures while conducting work at the site to prevent contact with contaminated material.

> **Several people expressed concern about the health effects of exposure to TCDD.**

A response to these questions was made at the public meeting by a member of the Agency for Toxic Substances Disease Registry. Research continues in this area and EPA is confident that a better understanding of the health effects of exposure to TCDD will come in the future.

> **Several people asked about the plans for Times Beach following remediation. One commentor questioned whether you could apply the results of a**

feasibility study without knowing the future use of the site.

The use of the Times Beach site following the completion of remedial activities has not been determined. Future land use at Times Beach will be dependent upon the extent of the cleanup and recommendations of state and federal health agencies. It is the intent of EPA to reduce the restrictions on site use that currently exist.

One person asked how deep you would have to dig if you were to remove the TCDD-contaminated soil and incinerate it.

The depth of excavation would vary with the level of contamination at depth. Sampling conducted to date indicates that the contamination is primarily limited to the upper 6 to 12 inches of soil in the roadways. The excavation procedures that would be followed are described in the Proposed Plan.

EPA was asked about the amount of soil that would be thermally treated and the time required to incinerate the material. The commentor went on to ask about the time required to cap certain areas at the site.

Information on the remedial action alternatives, such as that requested by the commentor, is included in the Proposed Plan. The volume of contaminated soil at Times Beach is estimated at 13,600 cubic yards. An estimated 12,000 cubic yards exist at the Minker/Stout/Romaine Creek site. The total volume of contaminated soil at all eastern Missouri dioxin sites is 92,200 cubic yards. Implementation times are discussed in the Proposal Plan.

One person asked about the status of information that she had requested from EPA under the Freedom of Information Act.

EPA provided a written response to the Freedom of Information Act request referred to by the commentor. The requested information was provided in a letter to Donald E. Meyer on March 19, 1987.

One commentor emphasized to EPA that the remedial method chosen should minimize the opportunity for run-off of contaminated soil into the Meramec River.

Measures will be taken during implementation of the remedial action at Times Beach to minimize erosion of contaminated soil into the Meramec River.

One person asked about posting of the Castlewood area and rezoning of a sawmill in the area. In particular, the commentor was concerned about potential exposure of the citizens to contaminated dust raised by trucks traveling along the roads in the area.

Removal actions at the Castlewood area have been completed. Contaminated soils present at levels considered to present a potential risk to public health were excavated and placed in interim storage onsite. EPA believes that the concerns expressed by the commentor were adequately addressed by completion of removal actions at the site.

One person questioned whether thermal treatment could be used successfully to destroy the dioxin.

Dioxin-contamination has been successfully destroyed in soils by thermal treatment using pilot scale thermal treatment units at Times Beach and by the EPA mobile incinerator at the Denney Farm site in Southwest Missouri. More recently, an ongoing remediation program at Johnson Atoll using a full-scale mobile incinerator to treat TCDD-contaminated soil has been successful. EPA believes that the technology is well-demonstrated and could be successfully used at Times Beach.

GENERAL ISSUES

Following the public meeting, many comments were received regarding the feasibility study and issues discussed at the meeting. These comments and their associated responses are listed below.

Some people were concerned that an incinerator, once installed, would become a permanent facility, and receive a variety of hazardous wastes.

EPA has made a public commitment to ensure that the incinerator is only a temporary facility, to be used only for treating dioxin contaminated materials from the eastern Missouri sites. The Record of Decision will clearly state that the incinerator is to be temporary. Conditions of the Record of Decision are enforceable through SARA citizen suit provisions. The State will also have control over the sources of material to be treated and duration of the project through conditions of the state-issued permit. The incinerator will be installed under contract by a private firm, and that contract will include the necessary funds for dismantling and removing the incinerator from the site, once the soil and other debris are treated.

Some people suggested that the contaminated soil be excavated and taken elsewhere.

The Feasibility Study considered an offsite disposal alternative, and calculated order-of-magnitude costs for such an approach. However, there are no offsite disposal facilities which currently have a permit which allows the acceptance of dioxin contaminated wastes. EPA has periodically contacted the several commercial facilities around the country, and has not found an alternative disposal location.

> **Several people, including the City of Eureka, Missouri, noted that considerable development is taking place in the area around Times Beach. These people generally expressed concern that locating an incinerator in Times Beach might harm the progress of that development, especially development as a recreational area.**

EPA is sensitive to the concerns expressed. The Agency believes that a thermal treatment facility can be designed and installed in a way that will not harm or slow the development of the area. EPA is committed to working with all interested parties in designing, building, and locating the treatment facility on the site in a way that will make it less objectionable and minimize visibility from the adjacent interstate highway.

> **Some people stated that thermally treating the wastes is not necessary, or that it would not be a reasonable use of government funds.**

EPA believes that the additional protection of human health and the environment offered by treatment justifies the additional expense relative to other alternatives evaluated. No other alternative provides an equivalent degree of protection at a lower cost. It is therefore the determination of the Agency that thermal treatment represents the most cost-effective remedy for Times Beach and the Minker/Stout/Romaine Creek Site of the alternatives evaluated in consideration of the potential need for response at the other eastern Missouri dioxin sites listed in the Proposed Plan.

> **Some people expressed the belief that it would be best to leave the soil undisturbed.**

As pointed out in the Times Beach Feasibility Study and Proposed Plan, excavation of the soil will increase the short-term potentials for exposure to and offsite migration of the contaminated soil. However, this short-term risk would be anticipated and controlled. If the soil is left, the potential for release and long-term exposure would continue indefinitely, since natural processes have not been observed to result in significant reductions in contaminant concentrations.

> **One person suggested placing the contaminated soil in bunkers, arranged as a floodwall.**

From the point of pure, technical feasibility, this approach could be taken. However, there is not nearly enough contaminated soil at Times Beach to construct a floodwall along the entire length of the river frontage at Times Beach. The remainder of a floodwall would have to be constructed of uncontaminated soil. The cost to complete a floodwall, and the additional costs of arranging the bunkers along the river (instead of in a more efficient grouping) would substantially increase the cost of containment. The additional funds required to complete such a floodwall would not represent a justifiable expenditure of CERCLA funds.

> **Some people were in favor of using an incinerator to treat the contaminated soil, and some of these people were also in favor of bringing the contaminated soil from the other residential sites to Times Beach for treatment.**

EPA also believes that this is the best approach for the dioxin sites in eastern Missouri. A balanced look at all of the advantages of a thermal treatment indicates that it is superior to the other alternatives examined in the Feasibility Study and Proposed Plan.

> **One person, while generally supporting the concept of incineration, stated that the mobile incinerator, which has been used in southwestern Missouri to treat dioxin contaminated soil, would not be acceptable at Times Beach. The person stated further that EPA should consider use of a particular company's incinerator (Shirco), because it would at least seem more temporary.**

EPA agrees that the mobile incinerator used in southwestern Missouri is too small to consider for use at Times Beach. While that incinerator has recently been modified to greatly increase its capacity, it is still not capable of treating the volume of soil at Times Beach and the other residential sites in an acceptable time period.

EPA is not proposing any particular thermal treatment technology or particular vendor of treatment units at this time. Thus, both incinerators and non-incinerator types of thermal treatment units are being equally considered. It will be up to the firms which submit proposals and bids for the work to propose particular treatment technologies.

> **One person argued against the idea of capping the**

contaminated soil in-place, because that would require the longest period of monitoring.

Long-term monitoring costs represent a significant disadvantage of all of the alternatives except off-site disposal (which is unfeasible because of the lack of a permitted facility) and permanent thermal treatment. In fact, the elimination of the need for long-term sampling and analytical monitoring, which is very expensive, is one of the most important advantages of thermal treatment. Long-term sampling and analytical monitoring is not required for thermal treatment options because the contamination is permanently destroyed. Long-term surveillance and cover maintenance costs associated with thermal treatment of soils exceeding 20 parts per billion dioxin are minimal relative to the potential cost of cap maintenance and sampling and analysis for in-place containment alternatives.

One person, who represents a vendor of compressed gases, recommended use of oxygen-fed incineration.

As noted elsewhere in this responsiveness summary, EPA is not examining specific treatment technologies at this time. EPA is considering general approaches for the cleanup at Times Beach and for the management of any resulting wastes. After the Record of Decision is final, EPA will issue a request for proposals. At that time, firms submitting proposals and bids will be free to consider oxygen-fed incineration and propose its use if they see advantages in it.

One person, who represents a hazardous waste management consortium, recommended solidifying the soil at Times Beach, transporting it to Texas in solid form, crushing the solidified soil and converting it to a slurry, and then injecting it into a salt dome where it would solidify once again, and be permanently trapped.

EPA sees several difficulties with this proposal, any one of which would delay a cleanup at Times Beach for some time. One of the most significant is the need for the salt dome facility to have a RCRA permit that would allow injection of dioxin into the formation. Acquiring such a permit could require two or more years, or may not be possible. Long-term management of the contaminated soil would still be required. Less expensive land disposal alternatives were evaluated in the feasibility study and Proposed Plan which offer a similar degree of protectiveness.

One person made a proposal with the following main features: (1) The dioxin contaminated soil would be consolidated somewhere in the southern portion of the site. (2) The northern portion of Times Beach would be excavated, presumably to the depth of the water level in the Meramec River,

and piled on top of the southern half of the site. This would raise half the site out of the floodplain, without decreasing the capacity of either the floodplain or the floodway. It would also result in the dioxin being buried under about ten to fifteen feet of soil. (3) The elevated portion of Times Beach would be deeded to the Industrial Development Corporation of Eureka, Missouri.

There are regulatory, technical, and cost considerations which make implementation of this alternative unfeasible.

The major regulatory requirements would be those under the Resource Conservation and Recovery Act. Those regulations would require that the soil be placed in an engineered facility that would contain the dioxin. Once the soil was contained in such a facility, there would be no justification for excavating half the site and placing it on top of the facility. The additional excavation would not represent a justifiable CERCLA expense. Other less expensive land disposal alternatives were evaluated in the feasibility study and Proposed Plan which often an equivalent degree of protection.

Several people expressed a concern that an incinerator would contaminate the Meramec River with salt.

Water used for cooling and air pollution control would be treated, tested, and stored pending verification that state requirements for land application are achieved. No direct discharge of any material into the Meramec River is being proposed by EPA.

Some people stated that incineration is too expensive when compared with the other alternatives in the Feasibility Study.

While it is true that incineration is more expensive, EPA believes that the additional benefits offered by thermal treatment, including permanent destruction of the contamination, justify the additional expense. In other terms, EPA has decided that thermal treatment represents the most cost-effective alternative. This determination is documented in the Proposed Plan and Record of Decision.

Two people suggested building a lake at Times Beach.

The amount of soil that would be excavated at Times Beach is not sufficient to provide a basin for a lake. Dioxin has not penetrated the soil very deeply at Times Beach. The samples EPA has collected at Times Beach indicate that the contamination is almost entirely limited to the upper 6 to 12 inches, and that it is primarily under the roads which were sprayed with contaminated oil. While the volume of contaminated soil is large by some measures, it is less than the volume of even a small lake. The additional cost to excavate a basin for a lake is not a justifiable CERCLA expense.

> **Many people expressed a desire to have the debris and abandoned houses at Times Beach cleaned up.**

EPA is sensitive to the need to address the debris and structures at the site. EPA has evaluated remedial alternatives for this material in the feasibility study and Proposed Plan. The Proposed Plan includes demolition and onsite land disposal of structures and debris.

> **Some people expressed concern that an accident might occur with the incinerator, resulting in dioxin contamination being emitted to the environment.**

As with any large piece of machinery, it is necessary to recognize that there is some potential for operational problems. EPA believes that a careful and conservative design, together with careful operation and oversight, can ensure safe operation.

Some thermal treatment technologies are less prone to operational problems, or to release of contaminants in the event such problems, than are others. EPA is aware of these differences, and will take them into account in selecting the proposal and bidder to construct and operate the thermal treatment unit at Times Beach.

> **Many people argued in favor of capping the contaminated soil in-place, rather than any more aggressive cleanup effort. The City of Eureka has expressed a willingness to consider responsibility for the long-term care and monitoring that would be required if the soil is capped in place.**

EPA has evaluated in-place containment alternatives in the feasibility study and Proposed Plan. Disadvantages of this alternative include the need for long-term access restrictions, long-term operation and maintenance costs, and the potential for future release and exposure. A detailed evaluation of this alternative is provided in the Proposed Plan.

One person, representing the Eureka Fire Protection District, expressed safety concerns regarding the current situation at Times Beach and regarding an incinerator. Specifically, the person is concerned with the amount of combustible materials at Times Beach, and with the possibility that the Eureka Fire Protection District would be responsible for responding to any fires that might occur if an incinerator is installed at Times Beach.

All remedial activities undertaken at the site will be in accordance with an approved health and safety plan. One objective of this plan will be to minimize the potential for fires during implementation of the remedy. All areas within the site will remain accessible by emergency vehicles at all times during the cleanup of the structures and debris. All remedial activities will be scheduled and carried out in coordination with local emergency services so that service is not interrupted, and emergency workers are aware of any special considerations for responding to a situation at Times Beach.

Several people expressed concern about locating a thermal treatment unit close to a highway.

EPA believes that locating the incinerator near a highway is advantageous. The primary advantage is that truck traffic on secondary roads associated with the cleanup will be minimized. The interstate highway system is designed for the loads that will be involved, and the direct access which Interstate 44 provides to Times Beach will ensure greater safety for the people in the area.

Several people expressed concern about the steam that will be produced by the incinerator, specifically that the steam will increase the humidity in the area.

The amount of water that will be added to the air by the incinerator will not measurably affect the humidity. The amount of water produced by the incinerator will be too small, compared to the amount of water that is naturally in the air, for this to be a concern.

Several people opposed bringing dioxin contaminated soil from other eastern Missouri sites to Times Beach.

While EPA understands the concern, another implementable alternative for the soils at these sites has not been identified. Many of the dioxin sites in eastern Missouri are too small to erect onsite treatment units. Also, unlike Times Beach, many other sites are currently occupied, which would result in safety problems deriving from the truck traffic and additional site security considerations. These problems would be minimized by bringing the soil to Times Beach. Another primary concern is the cost of setting up a thermal treatment unit at each site which would greatly increase the total costs and delay the cleanups.

> **Some people expressed concern about the risks posed for site workers in excavating and incinerating the dioxin contaminated soil.**

Short-term protection of workers during implementation is an important consideration in selecting an alternative. EPA has developed extensive and detailed requirements for its workers at contaminated sites. Similar requirements have recently been established by the Occupational Safety and Health Administration (OSHA) and are now national standards for all cleanup workers at contaminated sites. EPA will require the cleanup contractor (who has not been selected yet) to follow these rules which include development of an Agency-approved site-specific health and safety plan in order to ensure that the workers are not exposed to any undue risks.

> **Several people, including the City of Eureka, Missouri, recommended capping the contaminated soil with an impermeable cap.**

It was not EPA's intention in the Feasibility Study to recommend a permeable cap over an impermeable one. The study addresses both, and concludes that either one is technically feasible. Both types of caps offer advantages and provide some degree of long-term protection. The permeable cap was used for the cost calculations, but EPA has expressed no preference for one particular type.

> **Several people expressed concern regarding the assumption made in the feasibility study that the site might someday be used again as a residential area. The people commenting were particularly concerned that residential cleanup standards would be used for the site.**

During preparation of the feasibility study, risk assessments were performed for several future land use scenarios, including residential usage. A residential scenario may be more conservative than the actual future use of the site, but EPA believes that it was appropriate for the purposes of the feasibility study to make this assumption, which allowed a valid comparison of remedial alternatives to be performed.

> **One person suggested that a commercial setting along Lewis road is a more likely scenario for the**

future use of the site than a residential scenario.

Future commercial development at the site was considered in the feasibility study and risks were calculated for such a scenario.

Several people expressed concern that the risks to public health were estimated too conservatively in the feasibility study. These people suggest that the risks posed by the site are much less than indicated by the estimates in the feasibility study.

The feasibility study evaluated public health risk in accordance with EPA's Superfund Public Health Evaluation Manual. This procedure results in a conservative estimate of the risk represented under various exposure scenarios. EPA believes that it is appropriate to consider this public health evaluation in the remedy selection process for Times Beach.

Several people suggested that levels of concern different than the 1 ppb standard used in the feasibility study would be appropriate for cleanup of the site. In particular, it was noted that higher levels should be used.

In 1984, Kimbrough, et al., recommended 1 ppb as a level of concern in residential soils in "Health Implications of 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) Contamination of Residential Soils". This assessment concluded that different cleanup levels may be appropriate in areas where residential exposure does not occur. EPA has acknowledged this and has proposed a cleanup level of 20 ppb at Times Beach on the basis of recommendations from health agencies. Cleanup levels for Times Beach are further discussed in the Proposed Plan.

One person noted that SARA expresses a preference (in section 121 (b)) for treatment alternatives that permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substance, pollutants, and contaminants. The person suggests that capping of the site would permanently reduce the mobility of the site contaminants, and is therefore entitled to preference.

The preference expressed in SARA is for treatment of hazardous substances. The capping alternative, which does not involve any treatment and which leaves the contaminants susceptible to migration and exposure, is an example of the types of approaches which are least preferable under SARA.

One person suggested that the removal and treatment alternatives would render the Times Beach site worthless.

EPA believes that following implementation of the proposed remedial action, Times Beach can be returned to beneficial use including potential park areas, greenspace, or commercial development.

Several people suggested that incineration was a relatively speculative technology. It was further suggested that the costs for incineration that were developed in the Feasibility Study were too optimistic and would likely be much higher, particularly in light of the costs that were incurred during incineration performed at the Denney Farm site.

EPA believes that incineration is a well-developed technology for treatment of contaminated material. The technology has been used for many years and was successfully applied at the Denney Farm site for destruction of dioxin in soils and liquids. The EPA mobile incinerator operated at the Denney Farm site was not originally designed or constructed to handle soils. The design limited the capacity which resulted in increased unit treatment costs. The EPA mobile incinerator has been retrofitted with equipment which is intended to increase the capacity and lower the unit treatment cost. The cost to operate an incinerator designed and constructed specifically for dioxin-contaminated soils at Times Beach would be substantially lower. EPA believes that the cost estimates presented in the feasibility study and Proposed Plan are representative of the costs likely to be encountered for remediation at Times Beach.

POLICY ISSUES

The EPA received many comments regarding policy issues addressed in the feasibility study.

One commentor refuted the logic of the assumption made in the feasibility study that the site would one day be returned to residential usage. The commentor stated that since the site would not be returned to residential usage, the application of a one part per billion (ppb) action level is not appropriate.

The feasibility study acknowledges that future residential use of Times Beach is unlikely. The EPA believes that it is unlikely that Times Beach will be returned to residential usage due to a combination of de-facto institutional controls and practical considerations discussed in the Proposed Plan.

Future land use will be controlled by the extent of cleanup at the site. The remedy described in the Proposed Plan will allow land usages which include park or greenspace and potential commercial development. All future land usage will be in accordance with state and federal health criteria.

The assumption of residential land use is made in the Times Beach Feasibility Study in order to evaluate alternatives on an equivalent basis. The EPA does not believe that changing the action level will affect the screening or noncost evaluation of alternatives in the feasibility study. If an action level differing from 1 ppb is established for Times Beach, the feasibility study cost evaluation will require adjustment. Revised cost tables for an action level of 20 ppb appear in the Proposed Plan.

The Feasibility Study acknowledges that different action levels may be appropriate for other land uses. CERCLA, as amended by SARA, does not require that a specific future land use be established prior to evaluation of remedial alternatives or remedy selection.

One commentor stated that it was unreasonable to believe that Times Beach would ever be developed for agricultural purposes; therefore, it is not appropriate to perform a risk assessment for that scenario.

Risk assessments were performed in the Times Beach Feasibility Study for several different future land uses at Times Beach including agricultural, recreational, and occupational scenarios. These risks were evaluated in order to characterize the risk to public health if no remediation of the dioxin-contaminated material at Times Beach is performed and the land is put to various uses. The feasibility study does not discuss the likelihood of the land use at Times Beach changing to any of the particular scenarios developed.

One commentor refuted the basis upon which 1 ppb action level is established for residential settings. The commentor stated that the assumptions used to derive the 1-ppb action level were overly conservative and result in an action level which is much too low.

The 1-ppb action level which is assumed in the feasibility study is based upon the 1984 report entitled, "Health Implications of 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) Contamination of Residential Soil," Renate D. Kimbrough, M.D., et al., Center for Environmental Health, Centers for Disease Control (CEH/CDC).

This action level has been applied during EPA removal actions at several sites in Missouri and at other sites nationwide. The EPA believes that the 1984 Center for Environmental health report is a valid risk assessment upon which to base an action level. The Center for Environmental Health has recently supported the paper stating that no scientific evidence has been reported in the literature to date which would invalidate the assumptions upon which the 1984 risk assessment is based, or its conclusions.

> **One commentor stated that the consideration of the CEH/CDC health assessment to establish an action level at Times Beach is not authorized, and that the 1-ppb level of concern is not an appropriate regulatory criterion. The commentor stated that EPA should rely on a site-specific health assessment to establish an appropriate action level for Times Beach.**

The EPA is required to attain all applicable or relevant and appropriate state and federal environmental requirements (ARARs). Although the 1984 Centers for Disease Control Health Assessment, upon which the 1-ppb action level is based, is not an ARAR, the National Contingency Plan (NCP) allows such criterion to be considered in the selection of a remedy. In the absence of other regulatory criteria for dioxin, EPA believes that it is valid and appropriate to base an action level on this assessment.

> **One commentor stated that action levels other than 1 ppb are appropriate for residential and nonresidential land uses. The commentor stated that an action level should be established for Times Beach which corresponds to the anticipated land use of the site.**

The EPA believes that residential land use at Times Beach is unlikely, as acknowledged in the feasibility study and Proposed Plan. The EPA agrees that it is appropriate to establish an action level for Times Beach soils which corresponds to a realistic anticipated land use for the site. In 1986, EPA initiated an evaluation of an appropriate action level at Times Beach, in coordination with the Agency for Toxic Substances and Disease Registry (ATSDR), Center for Environmental Health, Centers for Disease Control, the Missouri Department of Natural Resources (MDNR), and the Missouri Division of Health (MDOH). The result of this evaluation was the recommendation by federal and state health agencies of an appropriate action level for the Times Beach site. EPA has considered this recommendation in the establishment of a cleanup level and remedy selection for the Times Beach site.

> **One commentor stated that overly conservative assumptions are used to calculate risks for the three scenarios developed in the feasibility study.**

The procedures used in the Feasibility Study to calculate incremental cancer risks are in accordance with EPA policy and guidelines. Specifically, the procedures used conform to the EPA Public Health Evaluation Manual (1986). The EPA believes that the risk assessment procedures used in the Times Beach Feasibility Study are valid and result in a reasonable estimation of anticipated incremental cancer risks due to exposure in the various scenarios developed.

One commentor stated that the cancer potency value used to calculate risks in the feasibility study is too high.

The public health evaluation presented in the Times Beach Feasibility Study is performed in accordance with Agency guidelines and policy. These guidelines specify that incremental cancer risks will be calculated using cancer potency values adopted by the EPA Carcinogenic Assessment Group (CAG). The EPA believes that the cancer potency value adopted by the CAG is appropriate and supported by scientific data.

One commentor stated that additional factors affecting the mobility of dioxin-contaminated soil need to be considered in the selection of remedy for Times Beach.

The EPA believes that the vertical and areal extent of dioxin-contamination has been adequately defined at Times Beach during the past field investigations involving the sampling and analysis of surface and subsurface soils. Sampling at Times Beach and at other Missouri dioxin sites has indicated that the dioxin is tightly bound to soil particles, and that migration of the dioxin is directly related to the transport of the contaminated soils. The EPA does not believe that the dioxin contamination at Times Beach represents a significant threat to groundwater or air quality on the basis of sampling conducted by EPA at Times Beach. Sampling of sediment and biota in the Meramec River adjacent to Times Beach do not indicate that the site is a significant source of dioxin in surface water. The EPA believes that this empirical information forms a valid basis for the selection of a remedy at Times Beach and has considered the observed mobility characteristics in the remedy selection.

One commentor stated that the health and environmental risks associated with dioxin are less than generally assumed.

Risks in the feasibility study are calculated in accordance with procedures set forth in the EPA Superfund Public Health

Evaluation Manual. The risk model employed uses cancer potency values adopted by the EPA Carcinogenic Assessment Group. The EPA believes this is a valid procedure for determining risks to public health from known or suspected carcinogens.

In addition to the public health evaluation included in the Times Beach Feasibility Study, EPA has relied on the 1984 Kimbrough assessment, and an additional health assessment performed by the ATSDR for the Times Beach site in selecting an appropriate remedy.

The EPA does not believe that environmental risks are overestimated. Times Beach lies in the 25-year floodplain of the Meramec River. Due to bioaccumulation factors as high as 30,000 reported in the literature, any migration of dioxin-contaminated soil into the Meramec River could potentially result in dioxin concentrations of environmental concern in fish and other aquatic biota. Furthermore, human consumption of these contaminated fish or other biota could result in a risk to public health.

> **One commentor stated that it is not appropriate to clean up sites to a level which corresponds to an incremental cancer risk in the range of 10^{-4} to 10^{-7}.**

The Superfund Public Health Evaluation Manual states that a 10^{-4} to 10^{-7} incremental cancer risk level may be used to determine the appropriate extent of cleanup at a Superfund site. The EPA believes that it is appropriate to remediate Superfund sites to this extent.

> **One commentor stated that there is no justification for using CERCLA funds for remediating the uncontaminated structures and debris.**

In 1984, a decision was made by EPA to permanently relocate residents and businesses within the City of Times Beach due to the discovery of dioxin contamination. This decision resulted in EPA accepting final management responsibility for the structures and debris remaining in Times Beach following the permanent relocation. Final management of this material is justified under CERCLA on the same basis as the permanent relocation, which is the threat which existed in 1982 due to the discovery of dioxin contamination on the roadways of Times Beach. This action will serve as a completion of the permanent relocation.

> **One commentor stated that there is no justification for further analysis of non-dioxin organic contamination found at the site.**

The EPA does not believe that the extent of contamination by other organics has been adequately characterized. Prior field investigations have detected the presence of non-dioxin organic contamination in soils in the city park area at depths as great as 20 feet and in groundwater. Concentrations of other organics detected range as high as 10 parts per million (ppm) toluene in groundwater and 7.2 ppm ethylbenzene in soil. The EPA believes that there is sufficient justification for additional investigation of non-dioxin organic contamination at Times Beach.

One commentor stated that it is not appropriate to consider state and federal water quality criteria in the selection of a remedy for Times Beach.

The EPA has published a partial listing of potential applicable or relevant and appropriate requirements which Superfund remedies must comply with. Federal and state water quality criteria are included in this listing. The EPA believes that federal and state water quality criteria are potentially relevant and appropriate, if not applicable to waters of the Meramec River. SARA requires that remedies at Superfund sites must attain all identified applicable or relevant and appropriate federal and state environmental requirements. The EPA believes that federal and state ambient water quality criteria established under the Clean Water Act and state law should be considered in the selection of a remedy at Times Beach.

One commentor stated that waivers from applicable or relevant and appropriate environmental requirements (ARARs) under SARA are not given due consideration in the *Times Beach Feasibility Study*.

Waivers from ARARs have been considered in the selection of remedy at Times Beach. A discussion of the potential waivers considered for remedial alternatives at Times Beach are addressed in the Proposed Plan. This document has undergone public review in accordance with CERCLA requirements.

One commentor stated that EPA should treat all of the dioxin sites in Missouri as a single site for purposes of remediation.

The EPA believes that there are efficiencies and economies of scale to be gained by considering a comprehensive remedy for all of the dioxin sites located in eastern Missouri. The EPA has considered establishment of a centralized thermal treatment facility at Times Beach for treatment of dioxin-contaminated soils from other eastern Missouri sites. This alternative has been developed and presented for public comment in the Proposed Plan, and represents an integrated approach to resolving the Missouri dioxin situation.

One commentor stated that the risks are too low at Times Beach to justify any alternative beyond no action.

Federal and state health agencies have advised that removal of soils exceeding 20 ppb dioxin is required to reduce the potential incremental cancer risk at Times Beach to the 10^{-6} level. This goal is consistent with the CERCLA policy of reducing risk to the 10^{-4} to 10^{-7} range. This risk will be further reduced by placement of a one-foot clean soil layer over all areas at Times Beach exceeding 1 ppb. The EPA believes that this risk-based level of cleanup is an appropriate goal for the remediation of dioxin-contaminated soils at Times Beach.

One commentor stated that the feasibility study fails to consider the CERCLA statutory preference for practicable permanent solutions.

SARA establishes a statutory preference for remedies which utilize permanent solutions to the maximum extent practicable. The EPA believes that the thermal treatment alternatives considered in the feasibility study and in the Proposed Plan represent remedies which utilize permanent solutions to the maximum extent practicable.

One commentor stated that an inadequate opportunity is provided for public involvement in the remedy selection process at Times Beach.

The statutory requirements for public involvement in the remedy selection process at Times Beach have been satisfied. The Times Beach Feasibility Study was released for public comment on December 29, 1986, beginning a 3-month public comment period which ended March 27, 1987. A 1-month extension to the public comment period was granted at the request of this commentor. An additional one-month public comment period was held for the Proposed Plan. During this additional public comment period, all documents contained in the draft administrative record, which contains all documents forming the basis for remedy selection at Times Beach, were available for public review and comment. A responsiveness summary has been prepared which addresses all of the issues raised during the public comment periods. This responsiveness summary is a component of the Record of Decision which formally selects the remedy to be implemented at Times Beach.

One commentor stated that restoration of the site for residential use is of questionable legality.

The proposed remedy at Times Beach does not include or allow return of Times Beach to residential use, although following remediation some areas of the site will meet the criteria for residential usage. The selection of remedy for the site is based on protection of public health and the environment under current and anticipated future exposure scenarios. As stated previously, the EPA believes it is unlikely that Times Beach will return to residential land use due to institutional and practical considerations.

One commentor stated that land use restrictions exist which would enable potential exposure to dioxin-contaminated soil at Times Beach to be limited.

The EPA does not believe that institutional controls of this type are adequate by themselves to control potential human and environmental exposure in the future. The EPA does acknowledge that institutional controls exist for Times Beach which, in combination with the remedy proposed, are protective of public health and the environment. These institutional controls are discussed in the Proposed Plan.

One commentor stated that the excavation and storage of dioxin-contaminated soil at other sites will affect EPA's decisions regarding remedy selection at Times Beach.

The feasibility study acknowledges the need for management capacity for dioxin-contaminated soils at other eastern Missouri dioxin sites. Due to the current absence of management capacity for dioxin-contaminated soils, the remedy selected for Times Beach will impact other eastern Missouri dioxin sites. The potential need for cleanup of these other eastern Missouri sites should not be disregarded in the selection of remedy for Times Beach. The EPA believes that it is logical and appropriate to consider a comprehensive remedy for eastern Missouri dioxin sites.

One commentor states that permanent relocation was offered to businesses and residences in Times Beach as a result of the flooding and not because of the dioxin contamination.

The decision by EPA to offer permanent relocation at Times Beach was related to the discovery, in December 1982, of wide-spread dioxin contamination within Times Beach. Flooding contributed to the emergency situation. However, permanent relocation was offered due to the discovery of hazardous substances at Times Beach and recommendations by health agencies to prevent continued exposure from occurring.

One commentor stated that there was an inadequate opportunity provided for public participation in the remedy selection process for flood-control

measures at Times Beach.

The opportunity for public comment on the Spur Levee Project was provided. The Spur Levee Project was described in the recommendations and schedule of the Central Storage Site Project Feasibility Study--Missouri Dioxin Sites. This study was released to the public December 7, 1983, and a public meeting to present and accept comments on the recommended alternative was held December 13, 1983. Additional written comments were accepted through December 27, 1983. This public comment period satisfies the statutory public participation requirement for CERCLA remedial actions.

An environmental assessment was prepared by the U.S. Corps of Engineers for the Spur Levee Project. The public was notified through local news media of the opportunity to comment on the environmental assessment prepared for the proposed project and provided an additional 2-week public comment period prior to implementation.

DETAILED TECHNICAL COMMENTS ON THE FEASIBILITY STUDY

One commentor offered detailed technical comments on the feasibility study. These comments are given below.

> **Assuming future residential use [at Times Beach] is unreasonable....the feasibility study's use of a residential cleanup standard--for a site that is unlikely ever to be residential again--is a serious conceptual error...**

EPA is not proposing to return Times Beach to residential usage. Future residential usage was one of three exposure scenarios considered in the public health evaluation presented in the feasibility study. Due to the uncertainty in future land use during preparation of the feasibility study, a range of exposure scenarios was used including residential, commercial, and recreational. For the purpose of estimating a contaminated soil volume, the most conservative future use was assumed. The non-cost comparison of alternatives for the contaminated soil volume corresponding to residential use is valid for a range of soil volumes, including the current estimate. Cost evaluations were revised in the Proposed Plan to reflect the current projected soil volume at Times Beach. EPA believes that these evaluations represent a valid basis for remedy selection at Times Beach.

> **Another major flaw in the feasibility study is the failure to conduct a risk assessment in order to develop site-specific cleanup objectives....having assumed future residential use, the feasibility study simply adopts a cleanup standard equal to**

> **CDC's generic "reasonable level at which to begin consideration of action to limit human exposure for contaminated soil."**

During response actions performed at dioxin sites in Missouri, EPA has relied upon the recommendations of federal and state health agencies in determining appropriate cleanup levels. CDC has recommended that 1 ppb is a reasonable level at which to express concern for public health in residential settings. During preparation of the feasibility study, EPA evaluated the CDC recommendation and determined that 1 ppb was an appropriate level of concern for evaluation of alternatives. The feasibility study notes, however, that different cleanup levels may be appropriate for other land uses than that assumed in the study.

> **...the use of overly conservative factual assumptions, results in a gross overstatement of both the hazards of TCDD and the amount of site cleanup necessary. The use of the highest single sample value as a basis for planning site cleanup results in a distortion of remedial strategies.**

The public health evaluation was prepared following the guidelines of the Superfund Public Health Evaluation Manual. As noted in the manual, "This manual establishes a framework for public health evaluation at Superfund sites...." The manual states explicitly that a conservative approach may be taken in making risk estimates. It is clearly stated in the feasibility study that this was the approach taken and the assumptions were noted.

> **The risk, assuming that Times Beach is not redeveloped for residential use, is truly minimal.**

EPA has considered the recommendations of federal and state health agencies regarding the risks presented by the site. Those recommendations indicate that the risks posed by the site require response to protect human health and the environment.

> **...the safest, most protective course is to leave the TCDD in place, with, at most, an appropriate vegetative cap to prevent soil erosion.**

Covering contaminated areas at Times Beach with a vegetated cap was evaluated in the feasibility study and Proposed Plan. This alternative was determined not to achieve CERCLA and NCP remedy selection criteria to the same extent as the proposed remedy. The rationale for this determination is described in the Proposed Plan.

> **The reason that capping does not meet site**

> **objectives is...that the site objectives set forth in the feasibility study are unrealistic.**

EPA disagrees that the goals set forth in the feasibility study are unrealistic. The goals are based on recommendations of appropriate state and federal health agencies. Remedial alternatives were developed based on these goals.

> **...the feasibility study incorrectly views the procedures for capping and closure under the Resource Conservation Recovery Act (RCRA) as being ARARs. In fact, those standards were developed for landfills at which a heterogeneous yet concentrated assortment of unknown wastes have been buried,...**

It is not EPA's position that landfill closure requirements are applicable only to landfills containing heterogeneous, concentrated, and unknown wastes. EPA has determined that landfill closure regulations are applicable or relevant and appropriate to some remedial alternatives, as described in the Proposed Plan.

> **Even if the RCRA standards are appropriately viewed as ARARs, the feasibility study improperly fails to consider whether waivers are appropriate under the circumstances.**

A discussion of potential waivers from ARAR's for the remedial alternatives evaluated for Times Beach is presented in the Proposed Plan.

> **EPA acknowledges that it is legally required to evaluate the "No Action" alternative. Yet its treatment of this option is purely perfunctory.**

EPA disagrees that the treatment of the no action alternative is perfunctory. The development and analysis of remedial alternatives is affected by the technical complexity of the alternatives. The no action alternative is of limited complexity; therefore, less space is required to develop and analyze the alternative. In the feasibility study, EPA evaluates the No Action alternative as seriously as the other alternatives.

> **Certain of the options receiving detailed analysis--for example, excavation followed by either offsite land disposal or offsite incineration--should have been eliminated from further consideration at the outset because of their excessive cost and the lack of permitted facilities.**

Offsite land disposal or incineration are considered to be technically viable options that warrant consideration as remedial alternatives. Offsite land disposal or treatment capacity could potentially develop prior to remedy selection.

> **...the feasibility study endorses a sampling and excavation approach that is likely to lead to massive cost overruns. An alternative strategy of extensive initial sampling, followed by single-lift excavation and limited confirmatory sampling, would save substantial amounts of time and money.**

A number of excavation strategies have been evaluated by EPA and tried in the field. The strategy described in the feasibility study is similar to that used at other TCDD sites and is considered to be cost-effective and accomplishes remediation objectives. Further discussion of this point is provided in responses to comments regarding final actions at the Minker/Stout/Romaine Creek site.

> **...steel roll-off bins, which are expensive to purchase, handle, and decontaminate, are proposed for soil transport. Bulk handling techniques, by contrast, which have been successfully used by EPA Region VII in southwest Missouri, would be equally safe and much less costly.**

As noted in the feasibility study, the details of material handling will be re-evaluated during the predesign and design of the selected remedial alternative. Air-tight roll-off bins provide a high degree of safety during transport, which may be warranted in densely populated areas.

> **The use of relatively small excavation equipment, such as backhoes, sacrifices significant economies of scale possible with use of larger equipment.**

The details of an excavation strategy will be evaluated during design of the selected remedial alternative. The methods described in the feasibility study are similar to those successfully used by EPA during removal activities at similar TCDD-contaminated sites in Missouri.

> **The discussion of worker protective clothing appears to assume the use of "moon suits", with the attendant expense and loss of worker productivity....a site-specific risk analysis should have been performed and would have resulted in a more rational level of protective clothing.**

It appears that the commentor, in referring to "moon suits," is referring to the use of Levels A or B protective gear. The feasibility study assumes that Level C gear will be used for soil handling activities, which is typical of protective gear used for remediation at other Missouri TCDD sites.

> **For transportation of soil from offsite, such extravagantly expensive strategies as upgrading of local roadways, and use of "pilot cars" to accompany trucks hauling soil, appear inexplicably to have received serious consideration.**

The details of the selected remedial options will be evaluated more closely during the design of the option. Upgrading of roads and use of various control devices will be used as required to implement the selected remedial alternative and protect the safety of workers and the public.

> **[Thermal treatment] Technologies specifically designed for low BTU-value soils, and which are therefore much less costly and more efficient, are not adequately considered. One very promising technology receiving scant mention is indirect-fired thermal treatment with dry pollution control. This technology is well-developed and has been tested on TCDD-contaminated soil.**

As noted in the feasibility study:

"Remedial alternatives evaluated in this feasibility study are general approaches to remediation for the site. However, specific conceptual descriptions are given for each alternative for purposes of evaluation. Each description is representative of the alternative and was selected using general rationale given in the text."

"It is beyond the scope of this study to make a definitive determination of the precise technologies used for each remedial alternative. A more definitive analysis of the selected remedial alternative will be required during predesign of the selected alternative. It is likely, therefore, that the final remedial actions taken at the site will vary somewhat from those described in the study."

If thermal treatment were selected for site remediation, technologies such as the ones described by the commentor may be proposed for use at the site. Such proposals would be considered by EPA at that stage in the project.

> **Dry pollution control techniques would eliminate the need for wastewater treatment and reduce contamination of additional material with TCDD,...**

If thermal treatment were selected as a remedial alternative, alternate methods of pollution control would be evaluated during the design phase of the project. Methods of pollution control different from those described in the feasibility study may be offered by those proposing to perform the remedial activities. These alternate methods will be evaluated to ensure that the selected method meets required performance objectives.

> **...there is justification neither for extensive retesting nor for disposing of these materials [uncontaminated structures and debris] other than in a standard construction/demolition landfill onsite.**

Structures and debris at Times Beach must be tested to confirm that they are not contaminated and can be disposed of as non-hazardous solid waste. If contamination is detected, decontamination must be performed prior to disposal in a solid waste disposal facility, in accordance with permitting requirements.

> **There is no apparent reason why an incinerator at Times Beach could not be appropriately sized to handle soil from any Missouri TCDD site where a determination has been made to excavate soil.**

During the design phase, performance standards will be prepared which will require that the thermal treatment unit is capable of treating a given volume of contaminated soil in a specified time frame. Although decisions have not been made to excavate and treat soils from the additional potential sites identified in the Proposed Plan, the thermal treatment unit design will allow for the potential treatment of soils from these sites at Times Beach.

> **Each site has been treated as a separate problem, with no attempt to achieve consistency, coordination, or economies of scale. Such an approach has been both unnecessary and unnecessarily costly. Grouping of related, non-contiguous sites is expressly permitted under 42 U.S.C. Section 9604(d)(4).**

Alternatives evaluated in the Proposed Plan include potential responses at all identified eastern Missouri dioxin sites. It is not appropriate to evaluate remedial alternatives for Times Beach and the Minker/Stout/Roman Creek site in isolation. The cost effectiveness of the remedy for Times Beach and the Minker/Stout/Romaine Creek site must be evaluated in consideration of the potential need for response at other nearby related sites. This evaluation is performed in the Proposed

Plan.

Risk Assessment

> **The use of the single highest value for TCDD soil contamination, without giving due weight to the results of more than 500 other soil samples which reflect an average TCDD concentration of less than 2.5 ppb, is a totally inappropriate and unrealistic approach....it would be much more appropriate to use a TCDD soil concentration value of 2.5 ppb rather than 1200 ppb in the risk analysis.**

The use of a maximum is compatible with the methods outlined in the Superfund Public Health Evaluation Manual and represents a conservative estimate of risk. This was carefully noted in the feasibility study.

> **Because the feasibility study erroneously considers Times Beach a residential site, it has greatly overestimated the contribution of soil ingestion to the lifetime average daily dose of TCDD. Soil ingestion will not be a significant exposure pathway at a non-residential Times Beach.**

A cleanup level of 20 ppb has been established for Times Beach which is appropriate for non-residential exposure. This cleanup level is based on recommendations from federal and state health agencies, as discussed in the Proposed Plan, and considers limited ingestion in non-residential areas.

> **Based upon the CDC approach and CDC assumptions relating to TCDD risk to human health, the Level of Concern for TCDD at a non-residential site is 20 ppb.**

A cleanup level of 20 ppb has been established at Times Beach.

> **...animals at Times Beach would not consume sufficient soil to produce adverse effects.**

Elevated levels of dioxin have been detected in wildlife at the site. Due partially to potential bioaccumulation in wildlife, a one clean foot soil layer of clean soil is a component of the selected remedy at Times Beach.

Executive Summary

> **The definition of a cost-effective alternative referred to in the Executive Summary of the feasibility study appears to be the one used in the National Oil and Hazard Substances Contingency Plan (NCP) of 1983 rather than that which appears in the 1985 revision.**

This discrepancy has been corrected in the Proposed Plan and ROD.

> **...a primary incentive for the EPA buyout of Times Beach was related to the need for a permanent solution to the routine flooding of the town. In short, the primary purpose of the buyout was to improve the social good, not to protect inhabitants from the TCDD hazard.**

Many cities and towns are routinely flooded but are not bought out by the federal government. The buyout, as noted by reference material included by the commentor, was initiated when CDC recommended that residential exposure to soils containing TCDD exceeding 1 ppb represented a level of concern, which was the case at Times Beach.

> **...these figures for the various soil volumes are several times greater than the amount of soil in excess of 1 ppb which actually exists in Times Beach,...**

The volumes of soil presented in the feasibility study are remediation volumes estimated from available sampling data and assumptions regarding the extent of excavation that would be required. It is expected that the final excavated volume will differ from the estimates presented in the feasibility study.

> **The (risk) estimates are likely to overestimate the actual risks by a factor between 500 and 5,000.**

As noted in the feasibility study, the estimates of risk are considered to be conservative estimates calculated in accordance with EPA policy guidance.

> **...the sampling was biased upwards because it focused on areas of suspected contamination.**

This is a primary reason that existing sampling data could not be used to develop an average concentration for risk evaluation purposes. EPA's sampling strategy is to define the source of contamination, in this case the roadways, and expand the sampling perimeter from the source until the areal extent of contamination is defined.

> **The feasibility study should contain an evaluation of the potential health risks associated with various levels of TCDD contamination of the soil.**

EPA has relied upon recommendations of federal and state health agencies in determining the health risks posed by various levels of TCDD contamination. For the case of Times Beach these health agencies have recommended appropriate cleanup levels for different land uses.

> **Although the use of the single highest groundwater sample may be appropriate for estimating ultimate exposure to the community, this approach was not intended, nor can it be justified, for application to the risk assessment of contaminated soil.**

This comment has been responded to previously.

> **...the Superfund Risk Assessment guidelines were not intended for contaminated soil.**

The Superfund Public Health Evaluation Manual (EPA, 1986) is clearly intended to be used for soil as well as other release mediums. For example, pages 41 to 46 of the manual, which describe procedures for identifying release sources and media, identify soil as well as air, surface water, and groundwater as sources to be evaluated.

> **...the relatively few high values of TCDD detected in Times Beach were obtained primarily from beneath paved roads where human exposure is virtually impossible.**

The roadways throughout Times Beach generally consist of deteriorating macadam which can not be expected to provide an effective long-term barrier against exposure. The dioxin level used for the risk assessment resulted from analysis of a soil sample collected at Times Beach in a non-paved area.

> **A central problem with the current feasibility study is that much of the discussion is predicated upon a 1 ppb level of concern for a residential site, which is not one of the settings considered in the public health assessment.**

The public health assessment in the feasibility study did consider a future residential setting. Furthermore, the risks posed by exposure to soils containing TCDD in excess of 1 ppb in a residential setting have been estimated by the CDC. The increased cancer risks due to such an exposure were estimated to exceed 10^{-5} to 10^{-8}.

> **The feasibility study properly recognizes that it is completely inappropriate to return Times Beach to residential use. Nonetheless, the feasibility study proceeds to treat Times Beach as a residential site.**

The feasibility study does not claim that it is "completely inappropriate" to return Times Beach to residential use. It is noted that such a use is possible, although not likely.

> **...soil levels of TCDD in excess of 40 ppb for residential areas and soil levels in excess of 120 ppb in non-residential areas should be acceptable.**

EPA has relied upon recommendations of federal and state health agencies to determine an appropriate cleanup level. The levels noted by the commentor exceed the level of concern recommended by these health agencies.

> **Any risk assessment procedure that would suggest that 3 of every 10 persons who occasionally visits Times Beach will develop cancer as a result of exposure must be grossly overestimated.......it is particularly troublesome that such risks would be identified for this setting in view of the ample evidence indicating that, until exposures are sufficient to produce chloracne, not only would an increase in cancer not be expected, but also no other adverse health effects would be anticipated.**

The risk estimates developed in the feasibility study are conservative estimates, as noted previously and in the feasibility study. The estimates are based on the specific assumptions noted in the text.

> **Times Beach should not be restored to residential use.**

EPA is not proposing to restore Times Beach to residential usage. The Agency's preferred alternative is described in the Proposed Plan.

> **It would be useful for the report to put this level of increased risk into perspective.**
>
> **...if a 1 ppb clean-up level is implemented, the necessary degree of clean-up is overestimated by at least a factor of 50 to 100-fold.**

As noted previously, EPA has relied upon recommendations of federal and state health agencies in determining the degree of remediation that is required.

Section 2--Background

> **The first sentence should be revised to read, "Times Beach is in southwest St. Louis County, approximately 20 miles southwest of the City of St. Louis..."**

The statement made in the feasibility study is correct. The distance from Times Beach to St. Louis will depend upon the points of measurement, so different distances are possible.

> **The first sentence should be revised to read,... It is believed that the TCDD may have been generated at the NEPACCO chemical plant in Verona, Missouri."**

The sentence is correct as presented in the feasibility study.

> **...sampling exercises are significantly biased because sampling efforts have focused on suspected hotspots with minimal emphasis on assessing the most representative level of actual contamination at the site.**

EPA agrees that the original sampling was targeted to the most likely areas of contamination. This sampling program is cost-effective and suitable for feasibility study analysis. It is expected that additional sampling and analyses will be required prior to site remediation.

> **Replace the first paragraph with the following: ...A number of the streets in the 1 to 5 ppb range were not sprayed directly; contamination in these cases is the result of vehicular tracking."**

Some contaminated streets may not have been sprayed directly. It is not possible, on the basis of records or available data, to determine precisely which streets were originally sprayed with contaminated waste oil. Many of the streets may have become contaminated as a result of vehicular traffic.

> **Vertical migration would not be expected in areas other than those directly sprayed with waste oil.**

The available data and characteristics of dioxin suggest that vertical migration potential is less in non-sprayed areas than in sprayed areas.

> **The fact that only 3 of 26 yard samples yield detectable levels confirms the fact that contamination is not widespread and is confined to roadways and surface drainage ways.**

The Proposed Plan notes that the available data indicates that contamination is generally limited to roadways throughout Times Beach.

> **...volume estimates correspond to "loose" volumes rather than "bank" volumes. Consequently, the volumes cited are not true remediation volumes.**

The volume estimates in the feasibility study are "loose" volumes. Since the volume estimates are relevant primarily to the alternatives that involve removal, the loose volumes represent the volumes of material that would require handling.

> **In many cases, the surface concentration (which governs risk) was less than that detected at 6 inch depth.**

Surface concentrations of dioxin have been determined using a statistically based sampling protocol which determines average concentrations within individual portions of the site to the 95% upper confidence level. This sampling has defined areas within Times Beach requiring response.

Section 3--Summary of Public Health and Environmental Assessment

> **"For the future settings it is assumed that site access would not be restricted and land use in the vicinity of the site would differ from current land use." This statement is inconsistent with the feasibility study Introduction and Executive Summary,...**

This analysis was included in the baseline public health evaluation to determine present risk under a number of potential exposure scenarios.

> **The feasibility study should indicate the criteria by which these 12 contaminants (other organics) were identified.**

The criteria used to identify the 12 other organic contaminants is described in Appendix B to the feasibility study.

> **Although Appendix B does contain some discussion of these (other organic) chemicals, it is not**

> **adequately detailed.**

EPA considers the discussion of other organic contaminants to be adequately detailed. The focus of the feasibility study was remediation of structures and debris and dioxin-contaminated soils at Times Beach. The Proposed Plan states that an additional evaluation will be performed to characterize and evaluate other non-dioxin contamination.

> **...it is an overstatement to claim that several of the other organic chemicals are probable carcinogens.**

Among the other organic chemicals, trichloroethylene and bis(2-ethylhexyl) phthalate are classified by the EPA Carcinogen Assessment Group as probable carcinogens, and 1,1,2,2-tetrachloroethane is classified as a possible carcinogen. The listing of bis(2-ethylhexyl) phthalate as a probable human carcinogen was made after the feasibility study was released.

> **It is not justified to refer to those persons that live within a half mile of Times Beach as "local residents"...**

It was stated explicitly in the feasibility study that there are no people living at Times Beach. The feasibility study defines local residents as those living within a half-mile radius of Times Beach.

> **...returning Times Beach to residential use would be unlawful under CERCLA. It is inconsistent with this statutory scheme for EPA first to relocate a community permanently and then to perform further remedial action to return the site to residential use. There is no provision of CERCLA authorizing EPA to enter into a land development business, in which community residents are evicted and other individuals are recruited to reside in a community after it is restored.**

While it is not unlawful under CERCLA to return Times Beach to residential use, as discussed in the Proposed Plan, EPA is not proposing to return Times Beach to residential usage. Certain non-residential uses of the site will be possible following site remediation. Title to the site following the cleanup will be held by the State of Missouri. Through this mechanism, and the Missouri Registry of Abandoned or Uncontrolled Hazardous Waste Sites, the state will have control over future land use at Times Beach. It is possible that local zoning ordinances may be instituted which also control future land use at Times Beach.

> **...even if crops were grown on the site, scientific data exist that plants, in general, do not take up TCDD from the soil. Moreover, the TCDD exposure to**

> **agricultural workers would be de minimus, in contrast to the claims in the feasibility study.**

As noted in the feasibility study, there is conflicting evidence regarding the uptake of TCDD by plants. Estimates of plant uptake on TCDD concentration were not used to estimate risks to agricultural workers. The primary routes of exposure for agricultural workers were assumed to be dust inhalation and hand-to-mouth ingestion of contaminated soil.

> **...these risk ranges are not taken from the Superfund Public Health Evaluation Manual (EPA, 1985) as implied by these statements. If there is a source or a published policy position that mandates that risk be kept within this range, it should be cited.**

As noted on page 118 of the Superfund Public Health Evaluation Manual (EPA, 1986): "According to Agency policy, the targent total individual carcinogenic risk resulting from exposures at a Superfund site may range anywhere between 10^{-4} to 10^{-7}."

> **...these represent only draft guidelines and were primarily intended to be applied where populations exposed to this degree of risk were in excess of 10,000 persons.**

As noted on page 1 of the Superfund Public Health Evaluation Manual (EPA, 1986):

"This manual establishes a framework for public health evaluation at Superfund sites and for development of health-based performance goals for remedial alternatives that are based on applicable or relevant and appropriate requirements of other laws, where available, or risk analysis techniques where those requirements are not available.

There are no limitations noted in the manual on the populations exposed.

> **It is unclear how some of the values for excess cancer risk in Table 3-3 were calculated.**

The methodology used to estimate excess cancer risk is detailed in Attachment B-1 to the risk assessment included as Appendix B.

> **While the airborne dust concentration of 76 mg/m^3 may be reasonable for total suspended particulates (TSP), much of the TSP is not respirable due to their large size.**

It is agreed that not all of the airborne dust would be respirable. However, a specific size distribution for particulates at Times Beach is not available. Generally, 25 to

90 percent of airborne dust is respirable. It was conservatively estimated in the feasibility study that 100 percent of the airborne dust would be respirable. It is likely that the actual respirable function would be less than assumed.

> **Further, not all airborne dust arises from soil or crustal material.**

It is true that not all dust is of a soil or crustal origin. However, at Times Beach it is unlikely that vehicle or industrial emissions would be significant contributors to airborne dust. The most likely source at the site would be soil or crustal material at the site.

> **It is highly unlikely that there will be security guards patrolling Times Beach 8 hours per day for 40 years.**

Times Beach is currently patrolled by security guards hourly, 24 hours per day. It is anticipated that this practice will continue until cleanup of the site has been completed. It is therefore not unreasonable to assume that security guards will remain onsite. The length of time until cleanup is completed is dependent upon remedy selection.

> **While the fraction of inhaled dust that reaches the gastrointestinal tract is 0.625, only about 30% of what gets there is absorbed. If a gastrointestinal bioavailability of 30% is taken into account and the adult body weight of 80 Kg is used (Diem and Lentner, 1973), then the cancer risk decreases further to 1.8 X 10^{-8}.**

Bioavailability of dioxin in Missouri soils has been determined to be higher than 30%. Bioavailability factors of dioxin in Missouri soil as high as 60 - 70% have been reported in the literature.

> **...the exposure of such workers to airborne dust is similar to the security guard and is here calculated on the basis of unreasonable assumptions.**

Issues regarding airborne dust have been previously addressed.

> **...the mean contaminant concentration of other organic contaminants should be at least 10-fold lower than the maximum contaminant concentration.**

Although EPA agrees that the mean concentration will be lower than the maximum, it is not possible to accurately predict mean concentration on the basis of the maximum. Upper bound estimates of risk are presented in the feasibility study. It is also possible that subsequent sampling will detect higher maximum concentrations.

> **The amount of soil assumed to be ingested is also unrealistic. The figure of 50 or 100 mg of soil ingested per day used in the feasibility study are on the high range of what has been used by other risk assessments.**

Based on a review of the literature, 50 to 100 mg per day of soil ingested is a reasonable estimate for soil ingestion.

> **It is also unlikely that an individual would ingest 100 mg of dirt per day during the entire 185 day growing season. Only on tilling days could dirt ingestion approach 100 mg/day.**

A range of 50 to 100 mg of soil ingested per day was used in the feasibility study. The range used is appropriate for this activity.

> **...the adult body weight is closer to 80 kg than 70 kg.**

As noted later by the commentor, 80 kg is the average body weight for adult males. Since the exposure could occur for both males and females, an average body weight that considers both sexes would be appropriate. The average adult body weight is closer to 70 kg (155 lb) than 80 kg (170 lb).

Section 4--Screening of Alternatives

> **The general discussion at pages 4-1 to 4-3 does not reflect more recent EPA final guidance such as the EPA "Interim Guidance on Superfund selection of Remedy," Dec. 24, 1986, reprinted in [Current Developments] 17 Env't Rep. (BNA) 1603-7 (Jan. 16, 1987) or EPA draft guidance developed subsequent to enactment of the Superfund Amendments and Reauthorization Act of 1986, ("SARA") P.L. 99-499, 100 Stat. 1613 (1986), e.g., "Superfund Selection of Remedy Strategies and Options," November 12, 1986; "Superfund Selection of Remedy: Draft NCP Language (RI/FS Section)," February 26, 1987.**

The feasibility study, which was released for public comment on December 18, 1986, can not reflect guidance that was published subsequent to its release. The feasibility study is considered to be compatible with the requirements of SARA.

> **...EPA states that the State of Missouri has not designated a final use for Times Beach. It is logically impossible to generate a feasibility study without such a determination.**

Risks were evaluated for a range of potential future land uses. Federal and state health agencies have recommended appropriate cleanup levels for different future uses. This information allows a valid risk-based remedy selection to be performed. The revised cost and non-cost evaluation of alternatives passing final screening is presented in the Proposed Plan.

> **According to the feasibility study, a vital concern for a "No Action" alternative is wind erosion of TCDD contaminated soil. This is not, in fact, a concern with enhanced vegetation or the current state of vegetation at the site.**

Wind erosion of contaminated soil is a concern at the site. All contaminated surfaces are not stabilized by vegetation or pavement.

> **...the non-residential remediation Level of Concern should be applied to a site which experiences regular and frequent flooding damage.**

EPA is not proposing to restore Times Beach to residential usage. The cleanup level established for Times Beach corresponds to non-residential usage.

> **In many cases the "Typical Technologies" column does not list all appropriate technologies.**

Typical technologies are intended to be representative examples. The list of technologies was not intended to be inclusive.

> **The use of posted fencing would be the most cost effective means of security at the site and would allow the elimination of 24 hour guard service.**

Posting of the site would not provide adequate security. Site intruders are frequently apprehended by security guards during patrols. All roadways leading to Times Beach are currently barricaded and posted with appropriate signs.

> **Sedimentation basins, combined with a site perimeter fence, represent a more conservative method of meeting the general objectives than the "No Action" response.**

Sedimentation basins and perimeter fencing do represent a more conservative remedy than "no action".

> **...the use of appropriately sized and selected excavation equipment, combined with bulk handling techniques, bulk storage, and on-site disposal or treatment will provide substantial savings over conducting an excavation program using undersized, poorly selected excavation equipment, containerized handling and temporary storage prior to disposal or treatment. Enormous cost savings can be realized by the dramatic reduction in labor and the elimination of the following: multiple handling of the excavated materials; container purchase, handling and disposal costs; temporary storage costs; transportation costs; handling at the disposal or treatment area and the huge cost of disposal or treatment.**

The techniques described in the feasibility study are typical of those used with success by EPA in various removal efforts in Missouri. The details of the excavation and handling strategy will be further evaluated in the predesign and design phases of the project.

> **...the only known treatment technology which is currently available and which consistently provides destruction efficiencies that meet regulatory requirements is thermal treatment.**

This statement is consistent with the feasibility study and Proposed Plan.

> **The most cost effective means of thermal treatment of TCDD-contaminated soil is through use of indirect-fired incineration combined with dry pollution control.**

Rotary kiln incineration was used as an example of thermal treatment technologies in the feasibility study. Any thermal treatment technology capable of meeting the performance standards will be considered.

> **Costs of treatment using indirect-fired technology are in the range $150-$250 per ton of soil processed.**

Alternative thermal treatment technologies may be proposed during the bidding phase of the project and will be evaluated at that time. If indirect-fired is cost effective, one or more proposals incorporating this technology would be expected.

> **Other treatment technologies are experimental in their level of development, create environmental**

> **problems greater than those they solve, are extremely costly, or do not attain desired destruction objectives.**

This statement is consistent with the feasibility study and Proposed Plan.

> **A method which is not mentioned in the feasibility study that may provide considerable promise for in situ treatment of TCDD-contaminated soils is "enhanced in situ photolysis."**

It is doubtful that the technology would achieve the site-specific objectives required at the site. This process was evaluated and screened during the feasibility study process. Photodegradation has not resulted in significant reductions in surface concentrations at Missouri dioxin sites investigated.

> **Temporary storage of contaminated materials should be eliminated as an option...**

The specific material handling details of the selected alternative will be developed during the predesign and design phases of the project. Temporary storage will be used if it is considered to be cost-effective and necessary to ensure that performance objectives are met, including protection of human health and the environment.

> **If "Disposal" were selected, the excavated soil should be hauled directly to the disposal site without interim storage.**

The specific material handling details of the selected alternative will be developed during the predesign and design phases of the project. Temporary storage will be used if it is considered to be cost-effective and necessary to ensure that performance objectives are met.

> **If "Treatment" is selected, only that amount of soil required to provide feed stock to the treatment system should be temporarily stored on site, not to exceed one month's capacity of the treatment system.**

The amount of soil stored would be sufficient to permit cost-effective operation of the treatment system. If capacity is excess of one month capacity was required, that quantity would be stored. The specific details of soil staging requirements would be considered further during design of the facility.

> **Storage of TCDD contaminated soil is very straightforward and does not require rigorous facility design due to its very insoluble and non-**

volatile nature.

The design of any storage facility would be sufficient to protect the health of workers and the public during remedial operations. The specific details of any storage facility would be developed during the design of the facility.

The storage facility should be designed to prevent run-off containing contaminated sediment from reaching an uncontaminated area.

The remedial design will incorporate appropriate measures so that contaminant migration is minimized.

If thermal treatment were selected, precautions should be taken to cover the storage area to prevent excessive wetting of the soil due to rainfall, thus reducing the water evaporation load to the thermal treatment system, thereby reducing fuel consumption.

The remedial design will incorporate appropriate measures to ensure that soil moisture of the staged material is controlled.

TCDD-contaminated soil should not be excavated for the sole purpose of depositing it in another disposal location because the inherent physical properties of TCDD-contaminated soil make it such a low risk to the environment and general population.

The issues involved in disposal of TCDD-contaminated soil are discussed in the feasibility study. The remedial alternative selected by EPA is described in the Proposed Plan, and does not involve land disposal of dioxin-contaminated soil.

A safe disposal area need only prevent exposure by contact, eliminate erosion of the soil and prevent dust-borne migration of the contaminated material. This can be accomplished by construction of a monofill using contaminated soil, covering the fill with clean soil, and planting a vegetative covering over the clean soil.

A number of options for disposal, including construction of a monofill, are discussed in the feasibility study. The feasibility study does not rule out a monofill as a storage option. If land disposal were selected, the details of the storage facility would be evaluated during design and predesign of the facility.

> **...no leachate collection is required since water migrating through the fill would not contain any contaminants.**

Leachate from a disposal facility would likely contain TCDD-contaminated particles that would require separation prior to disposal of the leachate. In addition, since there is a possibility for a breach of the liners, a collection system would be required.

> **...there is no justification for flood control related to TCDD remediation. No evidence to date suggests that TCDD is migrating or leaving the site due to flooding.**

Flood control would be required to protect equipment or workers located onsite during implementation. Flood protection is required for some alternatives in order to comply with all ARARs. This is further discussed in the Proposed Plan and Record of Decision.

> **The "No Action" remedial alternative should be as fully explored as all of the other alternatives, especially because it represents an alternative which is scientifically, technically and economically viable.**

As noted previously, EPA believes that the no action alternative undergoes the same degree of evaluation as other alternatives in the Feasibility Study.

> **...an impermeable barrier is not required to stabilize and prevent the migration of TCDD contaminated soil.**

Several options for capping are discussed, both permeable and impermeable. Although one option is described in detail, the Feasibility Study does not rule out the possibility that other options would be considered if capping were selected for the site. The specific methods would be evaluated in greater detail during predesign and design of the project.

> **It is unclear whether the existing site security will remain in effect under this (the no action) option.**

The no action alternative is a remedial alternative that assumes that no additional emergency or remedial actions are taken at the site. For the feasibility study, it is generally assumed that security guards would remain, although risk estimates are performed that evaluate exposure potential in the case that the guards are removed.

> **The risk to an unauthorized intruder is negligible and does not merit the expense of full time security personnel.**

Security guards are necessary not only to protect the health and safety of intruders, but to assure no contaminated soil disturbance and/or offsite transport occurs.

> **The only response action which would require a level of flood protection is on-site treatment. No other on-site disposal option, or other response action, would justify the expense of flood control measures.**

The requirements for flood protection will be evaluated for the selected remedial alternative during the predesign and design phases for the alternatives. It is possible that options, other than onsite treatment, may require flood protection.

> **...if treatment of these waters is mandated by EPA, only filtration should be used to remove the TCDD contaminated soil particles. Any other types of treatment, including use of activated carbon or activated sludge, are not merited due to TCDD's dramatic lack of water solubility.**

The specific water treatment method selected will be evaluated during the predesign and design phases of the project and would be adjusted as required during the project. It is expected at this time that carbon adsorption treatment would be used during site activities for filtration and removal of organics.

> **...if "In-Place Containment" were selected by EPA as a remedial response action, a soil and vegetative cap is the only technology that should be considered appropriate for the TCDD-contaminated soil. Impermeable or low permeability capping techniques are not required for prevention of exposure, dusting and erosion of TCDD contaminated soil which is a highly insoluble and non-volatile material.**

If in-place containment were selected, the specific features of the cap would be evaluated and developed during the predesign and design phases of the project.

> **...the presence of a clay or impermeable barrier under a final soil and vegetative cover increases the likelihood of erosion of the final cover and greatly complicates the establishment and growth of the vegetation. Since percolation of water through the cap will not cause leaching of the TCDD into**

> **the groundwater, the additional, conservative, measure of installing an impermeable barrier is not justified and is actually detrimental to a lasting and aesthetically pleasing grass cover at the site.**

If in-place containment were selected, the specific features of the cap would be evaluated and developed during the predesign and design phases of the project. The Proposed Plan evaluates placement of a synthetic membrane beneath the vegetated soil cover.

> **Expensive sodding or erosion control mats are not justified in preference to conventional grass seeding operations since there has been no release of contaminated soils to date.**

The method used to establish vegetation on exposed soil would be evaluated during the design phase and selected according to the requirements of the remedy. The remedy must be cost-effective in addition to providing protection of human health and the environment.

> **Only direct treatment via thermal processing is capable of meeting desired target goals while providing a relatively low unit cost of treatment.**

Thermal treatment is the only treatment method that has been demonstrated to consistently meet goals for destruction of TCDD.

> **Indirect fired rotary kiln thermal treatment combined with dry pollution control devices will produce the most reliable and least costly treatment response in terms of labor and energy consumption.**

This and other methods of thermal treatment would be evaluated during the predesign and design phases of the project. If proposed by those offering thermal treatment services during the bidding phase of the project, the technology would receive consideration at that phase of the project.

> **At this point in the feasibility study, one should have a fairly accurate accounting of what hazardous substances are to be encountered and at what concentrations.**

Sampling at the site to date has been concentrated in the most likely areas of contamination. The sampling is considered to be sufficient to support feasibility study analysis, but additional sampling and analysis will be required during remediation activities onsite.

> **Direct contact of the existing TCDD contamination is unlikely due to its location generally beneath paved or composition roads.**

Although some of the TCDD is located beneath road surfaces, contamination has been detected in other areas with no cover or stabilization.

> **Capping with an adequate vegetative cover can be considered a flood or erosion control measure.**

Capping could represent an erosion control measure. Since a cap would not prevent or slow the movement of floodwaters at the site, it is not considered to be a flood control measure.

> **...capping "will" and not "may" reduce the potential for migration and contact.**

The performance of a response action will depend, in part, on the specific features of the action and maintenance activities that are required.

> **"The TCDD concentrations must be reduced to below less than 1 ppb to meet the site objectives." The ash or treated soil will more than likely be landfilled at the site and below the surface. Therefore, if the depth is sufficient, higher concentrations of residual TCDD may be allowable.**

Final disposal of treatment residue will be controlled by state-issued permit conditions. The residue must successfully pass a delisting petition in order to be disposed of as non-hazardous solid waste. A plan for disposal will be developed during the design phase for the project.

> **...technology considerations for physical/chemical treatment and biological treatment refer to the thermal treatment of soil which is inappropriate for these two types of technologies.**

This error in the feasibility study has been noted.

> **It is inappropriate to state an absolute requirement that a technology must achieve a 1 ppb average concentration. If the technology achieves significant results and has favorable economics, it may be viable and desirable to pursue to reduce the risks to public health and the environment.**

The selected technology must meet the performance objectives that are required for the site which will include delisting of treatment residue and compliance with any required permit conditions.

> **...further technologies may be developed, and should not therefore be omitted based strictly on an arbitrary selection of a Level of Concern. The feasibility study approach is not consistent with the NCP requirement that alternatives must be considered which "do not attain applicable or relevant and appropriate public health or environmental standards, but which will reduce the likelihood or present any further threat from the hazardous substances and that will provide significant protection to the public health and welfare and environment."**

The feasibility study is consistent with the NCP. All potential remedies under CERCLA, as amended, must be protective of human health and the environment. Those alternatives determined not to achieve protectiveness can appropriately be eliminated from further consideration.

> **There is no description of what relevant and appropriate federal public health or environmental requirements must be met by a cap, and why they are not satisfied.**

The feasibility study specifically notes on pages 7-39 and 7-51 the requirements that should be considered. The landfill standards at 40 CFR 265, Subpart N (Landfills), are cited as well as the closure standard at 40 CFR 265.310. A further discussion of ARARs is presented in the Proposed Plan.

> **"Unknown quantity of hazardous substances" under the heading "Waste Characteristics." Rarely will a site be as well defined as Times Beach in terms of the hazardous waste constituents and concentration. The level of data available for evaluation can hardly be termed "Unknown."**

The precise volume of soil requiring remediation will not be known until completion of the cleanup. The available data allow a reasonably accurate projection of volume, but there is uncertainty due to the non-uniformity of the contamination and procedures used to remove contaminated soil.

> **The commentor strongly agrees that the technologies of "Capping" and "Enhanced Vegetation" should be retained for consideration and that the remaining methods should no longer be considered appropriate.**

Placement of a vegetated cap over contaminated areas at Times Beach was further evaluated in the Proposed Plan.

> **...only on-site (as opposed to off-site) disposal or treatment should be considered. Off-site disposal or treatment would require lengthy and unnecessary transportation, temporary storage and other related expenses.**

EPA is proposing an onsite remedy for contaminated soils at Times Beach. Offsite disposal or treatment are considered to be technically viable options that merit consideration in the feasibility study. The fact that some alternatives require different transportation or handling expenses than other alternatives does not warrant their elimination from detailed analysis.

> **...the "Limited Action" and "In-Place Containment" remedial alternatives cited in Table 4-8 should be described under column "NCP Guidance Alternative Category" as "Alternative that attains or exceeds applicable or relevant and appropriate federal public health or environmental requirements."**

Limited Action and In-Place Containment alternatives do not necessarily attain all ARARs, and it is not appropriate to designate them as such.

> **A cap designed to address dioxin contaminated soil should have a two-fold goal of preventing physical contact with the contaminated soil and the prevention of erosion of that soil.**

This point is consistent with the feasibility study.

> **Capping is a conservative and scientifically defensible remediation technique.**

The usefulness of capping as a remediation technique depends highly on the material being capped, the site where capping is taking place, the type of cap that is installed, and the maintenance that is performed subsequent to installation of the cap. Alternatives involving capping are evaluated in the feasibility study and Proposed Plan.

> **...water percolation through the cap is acceptable and the cap should provide a physical barrier rather than a hydraulic barrier.**

Specific features of the design of a cap would be considered during design of the remedial alternative.

> **Several comments were made regarding cap location, design and monitoring.**

As noted previously, the details of a cap, if selected as a remedial alternative, would be worked out during the design and predesign phases of the project. Issues raised by the commentor would be considered at that time.

> **Sites should be remediated in the most efficient and cost effective sequence.**

Cost-effectiveness is a requirement for all remedies under CERCLA. There are other requirements that must be met for site remediation including protection of public health and the environment, compliance with ARARs, and use of treatment technologies that result in a reduction in toxicity, mobility, or volume of hazardous substances to the maximum extent practicable.

> **Sampling should be conducted at the onset of the project to facilitate design of the excavation.**

Subsequent sampling has been performed utilizing the 95% Upper Confidence Level protocol to more accurately define the extent of contamination. This has enabled more accurate projections of contaminated soil volumes to be made prior to remedy selection. Additional sampling will be performed, as required, to fully define the areal extent of contamination prior to soil removal.

> **The primary function of the sampling should be to define the lateral limit of the target surface contaminant concentration. A secondary function of the sampling should be to validate or adjust the design depth of excavation (generally one foot in contaminant source areas and six inches in contaminant dispersal areas).**

The primary purpose of soil sampling at Times Beach has been to define the areal extent of contamination. More labor-intensive and costly sampling procedures are required to determine the vertical extent of contamination.

> **...depth sampling should consist of incremental samples to verify the depth of excavation necessary to accommodate the target subsurface contaminant concentration.**

EPA has determined that it is more cost-effective to remove soil in successive lifts followed by additional sampling to determine residual contaminant levels, than to attempt to define the vertical extent prior to excavation. The thickness of the initial lift of soil removed is adjusted according to the contaminant level detected at the surface.

> **Equipment which may be utilized includes backhoes, motor graders, wheel loaders, belt loaders,**

> **scrapers, profilers and vacuums. Each has distinct capabilities... Minimal hand excavation should be anticipated.**

The specific techniques required for excavation will be established during the design and planning phases of the project.

> **...excavation should proceed to the full depth of contamination in an uninterrupted series of lifts. Excavation should commence at the upgradient (hydraulic) end of the site and progress generally as a single working face. Material should be removed in discrete lifts, rather than a single cut to total depth, to preclude the possibility of cross contamination.**

It is not possible to determine the precise vertical extent of contamination in a cost-effective manner which would assure confidence that cleanup levels are achieved following excavation to a pre-determined depth. Excavation of the site will proceed from upgradient to downgradient areas. Removal of soil in multiple lifts minimizes cross contamination due to spillage.

> **Backfill operations should parallel, and closely follow, the excavation operations. No daily cover of excavated areas should be required.**

A temporary cover is required prior to backfilling to prevent the spreading of contaminated soil while awaiting sample results which will determine if additional excavation is required. Backfilling follows excavation when it is established that cleanup objectives have been met.

> **backfill procedures are unnecessary.**

Backfilling is necessary to safely close the site and establish drainage.

> **Backfill material should be obtained from borrow pits to be developed in the immediate vicinity of Times Beach. Suitable borrow materials were located in investigations conducted by the U.S. Army Corps of Engineers...**

Suitable backfill material has been identified in the immediate vicinity of Times Beach.

> **The borrow pit may be developed at a rate to match backfill requirements, depending on design of the remedy.**

The rate of development of the borrow pit should be adjusted so that the overall project implementation can proceed in a cost-effective manner.

> **...an excavation/backfill cycle is detailed in the following:**
>
> **1. A clean dump truck enters the excavation staging area.**
>
> **2. The truck enters the unexcavated contaminated zone and excavated material is placed in the bed. Fill height remains below the plane of the bed lip.**
>
> **3. The truck exits the contaminated area and receives an exterior rinse.**
>
> **4. A canvas tarp is secured over the dump truck bed and the truck proceeds to the disposal or treatment area at Times Beach.**
>
> **5. The canvas tarp is removed and the truck dumps the contents at the storage area. The truck bed is cleaned as necessary to remove residual soil using pressure water spray or manual scrapers. The truck is given an exterior rinse at this time.**
>
> **6. The dump truck proceeds to the borrow pit and receives a load of backfill material in the bare bed. The canvas tarp is replaced and the truck returns to the remediation site.**
>
> **7. The truck enters on the clean side of the site and backs across compacted backfill to the working face and dumps load.**
>
> **8. The bed is scraped clean of soil.**
>
> **9. The truck returns to the excavation staging area as in 1 above and the cycle repeated.**

The procedures outlined by the commentor will be considered during design of the selected remedial alternative.

> **Groundwater monitoring is not required due to the insignificant concentrations of solvents and extremely insoluble nature of TCDD.**

Groundwater monitoring may be required in order to obtain a state-issued permit for solid waste disposal and/or treatment of the contaminated soil. All substantive requirements of the permitting process must be met.

> **Air monitoring is not required since no previous**

air monitoring results have indicated any migration of TCDD-contaminated soil from the site.

Previous air monitoring at Times Beach was not performed when remedial activities were taking place. Air monitoring has been used during removal operations at other dioxin sites in Missouri and would be performed at Times Beach.

Long-term monitoring of the site is accomplished through visual on-site inspections performed by a qualified technician.

Additional monitoring would be performed as required to meet long-term site objectives.

The vegetative caps should require very little maintenance after the vegetation has been established.

Surveillance and maintenance would be required to ensure that the integrity of the cap was maintained. The specific program would be developed during design of the cap and would be coordinated by the State.

Section 5--Development of Alternatives

Alternative 6B should be broadened to include soil from any TCDD site in Missouri which requires excavation.

EPA considered public comments on bringing additional material to Times Beach and concluded that contaminated materials from other locations not identified in the Proposed Plan would not be brought to Times Beach for incineration. The local community has expressed opposition to material being transported to Times Beach for treatment from other states, or other portions of Missouri. EPA has considered the position of the local community in proposing and selecting a remedial alternative.

The sites identified in the Proposed Plan are related to waste oil spraying conducted by the Bliss Waste Oil Company in the early 1970's. It is appropriate to consider a comprehensive remedy for a group of sites located in close proximity to each other.

The dioxin sites located in southwest Missouri are being addressed utilizing the EPA mobile incinerator located at the Denney farm site.

The commentor strongly believes that EPA should examine the "No Action" Alternative as comprehensively as it reviews all other remediation

Alternatives.

As noted previously, EPA believes that the no action alternative is examined as seriously as other alternatives. The limited technical complexity of the no action alternative limits the amount of discussion that can be devoted to the alternative.

> **...automatic sampling of surface run-off samples is described. These automatic surface monitors must be protected from flood events.**

Monitoring equipment would require protection from flood events.

> **"Once sufficient air sampling data establish a record of no release, all air monitoring would cease unless significant circumstances develop which would change the site characteristics."**

The specific features of a site monitoring program would be established during predesign and design of the selected alternative. Continuous ambient air monitoring would be required during site activity to assure the safety of workers and the local community.

> **...samples would be filtered and the sediments analyzed using high resolution analysis for TCDD concentration."**

This could be a feature of a sampling and analysis program. Such items would be developed in greater detail during the design of the selected remedial alternatives. Detection limits in the low parts per trillion range can be achieved without the use of high resolution analysis.

> **If data indicate that no contaminated sediment is leaving the site, monitoring frequency will be reduced and eventually phased out unless site characteristics are significantly modified."**

The feasibility study describes a two-phase monitoring program with the first phase used to define the requirements for the second phase program. Monitoring requirements will be determined during design.

> **...only two locations would require monitoring of site run-off. All other locations of major surface drainage from this site appear to drain uncontaminated areas.**

The specific features of a monitoring program would be developed during predesign and design of the selected alternative.

> **The need for both guards and fencing is unnecessary**

> **due to the minimal risk of exposure to site intruders who violate the fence barrier and warning signs.**

The use of fencing should reduce the requirements for full-time securities at the site. However, some limited security would still be required. The specific security requirements to be implemented would be determined during selection of the remedy.

> **...special seeding techniques or expensive stabilizing materials are unwarranted during the vegetation process because there has been no indication that there is migration of contaminated materials...**

Special seeding or stabilizing methods would be used as required to ensure that a vegetative cover were properly established, if such an alternative were selected. The specific techniques to be used would be evaluated more closely during the predesign and design phases of the project.

> **E?A should identify in the feasibility study the TCDD concentrations or level of contamination that will trigger the implementation of such contingency plans.**

It is beyond the scope of the feasibility study to identify such concentrations. If a limited action alternative were selected, state and federal health agencies would be consulted to determine the specific situations that would determine the need for contingency plans.

> **...offsite drainage monitoring should be for sediment only and not water since TCDD is attached to the sediment and not dissolved in the water.**

Since the sediment would be carried by water, it would be necessary to collect both. Sediment samples would be dewatered prior to analysis.

> **"Monitoring of particulate and sediment from the surface drainage of the site would establish a data base which may dictate reduced frequency or elimination of site monitoring, or the need to evaluate whether additional remediation is required.**

The feasibility study describes a two-phase monitoring program with the first phase used to establish the specific requirements for the second phase. Specific monitoring requirements would be developed during design.

> **...RCRA requirements which reduce or minimize**

> **migration of liquids through TCDD contaminated soil are not necessary.**

If requirements for a cap or cover under RCRA are determined to be applicable or relevant and appropriate or are otherwise necessary to provide protection of human health and the environment, these requirements must be met. A waiver from a potential ARAR is possible if the remedy achieves an equivalent degree of control.

> **Any in-place containment alternative should be designed such that its implementation will not increase the likelihood of erosion beyond that which currently exists. Therefore, special and costly measures to control erosion would not need to be implemented for this type of construction activity.**

It is possible that the implementation of an in-place containment alternative would inherently require soil scarification, preparation of anchor trenches, or other activities that may temporarily expose contaminated soil. Erosion control may be required for these alternatives. The specific approach would be developed during design of the alternative.

> **Hydroseeding is discussed exclusively as the seeding technology of choice, however, any conventional method of grass seed application should be satisfactory.**

Other methods of seeding may be acceptable. As noted in the feasibility study, approaches that differ from those described in the feasibility study may be selected during predesign and design.

> **Although a porous stabilizing mat should reduce loss of clean topsoil by erosion, only in rare cases would this expense be justified. In most cases, a minimal amount of replacement topsoil, followed by seeding, will repair any problem areas...**

Special stabilizing methods would be used as required to ensure that the integrity of the cap is maintained, if this alternative were selected. The specific technique used to repair eroded areas would depend on the location of the area of concern.

> **The asphalt option or synthetic membrane should be dropped from consideration. An impermeable cap is not required...**

If in-place containment were selected, options such as asphalt or synthetic membrane would be evaluated further during the predesign and design phases.

> **This asphalt membrane will be unattractive, be very susceptible to mechanical damage, require extensive maintenance, be very susceptible to ultraviolet attack and be very expensive while providing no better protection than the soil and vegetative cap. Any synthetic membrane which is sufficiently thick to provide adequate mechanical strength to withstand a gravel cover is extremely expensive. Some of the disadvantages associated with synthetic membranes are that they leak at the joints. As a result of field damage, they require periodic replacement, are very difficult to inspect without total removal of the gravel cover, are unattractive and are orders of magnitude more costly than a soil and vegetative cap.**
>
> **Where access roads are required, a cap using conventional asphalt paving techniques would provide a very acceptable cap.**

Issues regarding the selection of a specific material for capping the site would be considered further during the predesign phase, if this alternative were selected. The items described by the commentor will be considered.

> **Because in all cases the contamination is located along roads and in the adjacent ditches, the need for clearing of brush and debris should be minimal.**

The amount of brush and debris that would be cleared would be sufficient to implement the alternative and maintain its integrity.

> **Pulverizing existing asphalt and gravel road should not be required to allow grass growth to occur on 1 foot of topsoil.**

Roads would be pulverized as required to ensure the stability and integrity of the cap material. The specific techniques used would be determined during the predesign and design phases. The Proposed Plan describes leaving existing pavement in place in some areas as an additional barrier and would provide additional protectiveness relative to the remedy described in January 16, 1987 EPA correspondence to Renate Kimbrough attached to the Proposed Plan.

> **Most culverts can be eliminated and grading of the site can accommodate most site drainage problems. Culverts and grading would be used as required to maintain proper drainage at the site, if an in-**

> **place containment alternative were selected.**

The requirements for site drainage following implementation of the remedy will be determined during design. Grading of the site may not be compatible with the selected remedy.

> **...it should not be necessary to mow the site more than twice per year.**

Mowing will be performed as required to maintain the integrity of the cover and prevent damage due to factors such as fire. The specific amount of mowing that would be performed would be adjusted as required.

> **Because it is clean soil that is the focus of the soil handling and surface preparation required by this option, these measures can be performed with large scale and very efficient equipment.**

It was assumed in the feasibility study that such equipment would be used. The specific techniques will be evaluated further during design if this alternative were selected.

> **Once the vegetation is established, this method of capping provides one of the most maintenance free and low cost of maintenance remediation options available.**

The advantages and disadvantages of a vegetative cap would be considered further during design if an in-place containment alternative were selected.

> **...a very limited amount of vehicular traffic would be required. Where it is required, asphalt paved access roads should be provided.**

This would be considered further during design in consideration of the requirements of the selected remedy.

> **Dust control during surface preparation should not be any greater than that required by any other farming or excavation project.**

Special precautions must be taken because of the TCDD present in the soil, which would not be the case for most farming or excavation projects.

> **The spray-on type asphalt membrane will be relatively delicate. When the vehicles used to apply the sand topping drive over the membrane it will be damaged. Additionally, sand is extremely susceptible to erosion and will require continual maintenance.**

The advantages and disadvantages of such a material would be considered more closely, if applicable, during design of the remedy.

> **...the sand covering will require significant repair after each storm event. The necessity for frequent repairs will in turn cause further damage to the membrane as a result of heavy vehicular traffic in the form of front-loaders and other sand placement and grading equipment.**

Issues such as these would be considered during predesign, when a specific method would be chosen, if such an alternative were selected.

> **Inspection of the membrane will be very difficult due to the sand covering.**

The advantages and disadvantages of various containment methods would be considered further during the predesign of the selected alternative.

> **This technology is in no respect more durable than a soil and vegetative cover.**

The advantages and disadvantages of various containment methods would be considered further during the predesign of the selected alternative, if applicable to the remedy.

> **...there is a great deal of hand work required to prepare the area prior to the application of the membrane.**
>
> **...enormous amounts of site disturbance and labor are required to prepare for the membrane application.**

The amount of site preparation used to implement a remedial alternative such as in-place containment would be sufficient to ensure that the technology was properly applied and integrity maintained. These issues would be considered during design.

> **This remedial option is disadvantageous because of the extensive labor (particularly hand labor) requirements,...**

EPA agrees that there are advantages and disadvantages to the various technologies described for in-place containment. These issues would be further considered during design if in-place containment is a component of the selected remedy.

> **The unknown "durability" (of asphalt membranes) is**

> **a result of misapplying this technology to a problem it was never intended to address.**

The technology, as with others, was not intended specifically to be used for remediation at a site such as this. A key part of the evaluation process will be to evaluate the suitability of such technologies for such an application.

> **The requirement to clear brush and debris should be limited (for a synthetic membrane).**

Brush and debris would be cleared as required to implement the selected alternative.

> **By not covering the synthetic membrane with soil, sand or gravel the liner is subjected to severe ultra violet attack and the potential for mechanical damage. (pp. 8-9 and 8-10)**

The susceptibility of such a liner would be a function of the material that is used. It was noted in the feasibility study that such materials would be susceptible to damage from sunlight and are fragile. Such issues would be considered further during predesign when a specific option would be chosen for the selected remedial alternative.

> **Membrane repair and replacement will be significant since the liner has no protective overfill.**

A concern for the design of an in-place containment option would be to minimize the repair and replacement requirements for such an option. Issues such as this would be evaluated during the predesign and design phases for the project.

> **...surface preparation for installation of a synthetic membrane is extraordinary. The site grade must be perfectly smooth, and the application of a sand bed prior to membrane placement is the preferred technique of installation. All this requires a great deal of surface disturbance and hand labor.**

Issues regarding the implementation of an in-place containment alternative would be considered further during predesign. EPA agrees that existing surface preparation would be required for installation of a synthetic liner. The amount of surface preparation that would be required would be suitable for ensuring the integrity of the containment material.

> **Without substantial cover over the membrane, wind, flood and ultraviolet damage will be significant. Labor for surface preparation will be enormous. Durability is very poor and replacement after 5**

> **years of significant portions of the liner would not be surprising.**

It was noted in the feasibility study that these would be concerns for a synthetic liner used in this application.

> **The single most glaring disadvantage which was not mentioned is the very high installed cost of membrane material and hence the very high replacement and maintenance cost.**

A high installed cost of an option does not necessarily mean that maintenance costs will also be high. As noted in the feasibility study, installation of such an option would require a substantial amount of hand labor. Such issues would be considered further during predesign of the selected remedial alternative. It would be at that time that a specific process option would be selected.

> **The requirements of the RCRA hazardous waste landfill should only be addressed as they apply to the specific case of TCDD contaminated soil at Times Beach. Even the most rigorously designed TCDD contaminated soil disposal facility should only address the potential problem areas of erosion, dusting and exposure to the soil.**

The RCRA hazardous waste landfill regulations for dioxin wastes are clearly laid out in the "dioxin rule (50 FR 1978) and the permitted facilities regulations (40 CFR 264). The requirements for a hazardous waste landfill are relatively invariant regardless of specific waste. The regulations are not applied selectively, but are applied to all hazardous waste landfills which accept RCRA wastes for disposal.

> **...problem areas can be avoided by depositing the contaminated soil on grade, or partially or totally burying the soil, and then covering the contaminated soil with a layer of clean soil followed by a vegetative cover in a "monofill" design.**

As noted in the feasibility study, a monofill design would be an option if land disposal were selected as the remedial alternative to be implemented.

> **The physical properties of TCDD clearly mandate the application of "in-place containment" by means of soil and vegetative cap in lieu of the use of liners, leak detection and leachate collection systems, and impervious covers which are more expensive and scientifically unjustified.**

The recent CERCLA amendments require remedial actions to achieve all ARARs. If a level of control of the contaminants equivalent to an ARAR can be achieved by alternative means, a waiver from the potential ARAR will be considered and documented in the Record of Decision. If a soil and vegetative cap achieves an equivalent degree of control as a cap required by an ARAR, then a waiver from the ARAR may apply. This determination would be documented in the Proposed Plan and Record of Decision if an in-place containment alternative were selected for implementation.

> **Siting of any disposal facility considered for Times Beach should be based on a flooding study of the Times Beach site using the HEC computer model developed by the Army Corps of Engineers. To minimize the impact of the disposal facility's effect on the flood level, the facility could be partially buried.**

The impact of various land disposal options and locations on flood heights has been evaluated by COE using the HEC 2 computer model. It is expected that the design of such a facility would be prepared in close consultation with COE. Partial burial of such a facility would be an option, although many factors would be considered during design of such a facility.

> **It is stated that construction of an on-site disposal facility in the northwest corner of Times Beach (a contaminated area) would require that construction work be done in modified Level C Protective Equipment. No risk assessment exists which justifies this level of protection.**

Modified level C equipment is recommended by federal health agencies during performance of certain activities during dioxin site cleanups. This level of personal protection is typical of removal work that has been performed by EPA at numerous Missouri TCDD sites.

> **"...most samples have shown TCDD contamination in only the upper 12 inches" and in fact nearly all samples at concentrations above a non-residential Level of Concern are in the top 12 inches of roadways and shoulders. The contamination at depths of 4 feet at Quail Run were due to a utility line installation which caused surface contamination to be introduced to these depths. Even considering road grading and rutting of the streets, the material would not be expected at a depth below the 12 inches, which is what has been observed.**

EPA has discussed issues regarding cleanup levels for remediation at Times Beach in previous comments. The degree of remediation required would be consistent with guidelines recommended by state and federal agencies.

> **...RCRA regulations for conventional hazardous wastes should not be arbitrarily applied to TCDD contaminated soil, much less the extremely conservative "acute hazardous waste provisions."**

The dioxin wastes F020-F027 are listed at 40 CFR 261.31 as acute hazardous wastes. This listing was promulgated upon careful consideration and opportunity for public comment.

> **...EPA's November 7, 1986 Final Land Disposal Regulations (51 Fed. Reg. 40572, 40634) indicates that ninety-five percent of the TCDD contaminated soil in Missouri can be land disposed without restrictions.**

The "land ban" regulations the commentor refers to do indicate that most of the dioxin-contaminated soils EPA is aware of will meet the treatment standard (40 CFR 268.41) and can be land disposed in a RCRA permitted landfill. The statement quoted by the commentor does not imply that the subject soils are not hazardous waste. Nor does it mean that soils meeting the treatment standard can be land disposed at ordinary municipal landfills or other non-RCRA-permitted landfills.

> **Should any water be collected for disposal, the only necessary method of treatment is to remove all particulates below 5 microns. Carbon adsorption is not necessary,...**

The precise method for treatment of collected water would be evaluated during predesign and design of site operations. EPA anticipates that carbon adsorption treatment would be required for such water.

> **Delisting should be a very straightforward process...**

Delisting requirements are discussed in the noncost evaluation of alternatives portion of the feasibility study report.

> **The Contingency Plan cited in the report required the placement of a daily cover over excavated areas which are not yet shown to be free of contamination. This is an unnecessary, inefficient and overly costly procedure because currently exposed areas of Times Beach have shown no migration due to flooding.**

A concern during excavation would be possible erosion of contaminated soil by wind or rain. Reducing the spread of contaminated soil from the excavated areas would be cost-effective since it would minimize the total volume of material to be remediated. Such issues would be further evaluated during design of the selected alternative.

> **The double lined concrete or monofill facilities are more appropriately applied to a conventional hazardous waste facility for highly leachable wastes. The containerized storage technique should not be used for any type of hazardous waste problem.**

Various options are available for disposal of contaminated soil, as noted in the feasibility study. These options would be evaluated in greater detail if land disposal were selected as the remedial alternative to be implemented.

> **The polypropylene bags mentioned in the feasibility study are difficult to fill, handle, stack, are very susceptible to mechanical damage, and have a limited life when considered as a permanent disposal container.**

Semi-bulk sacks have limited potential for permanent disposal. Semi-bulk sacks are presently used for interim storage prior to treatment or disposal of the containerized material. The sacks have been used with success for dioxin-contaminated removal operations at dioxin-contaminated sites in Missouri.

> **...a more realistic depth of excavation would be six inches or at most approximately 1 foot, and the 1 ppb TCDD level should be modified to reflect revised and more scientifically justified surface and subsurface TCDD Levels of Concern...**

As noted previously, the excavation approach that would be performed would be consistent with recommendations of state and federal public health agencies.

> **The use of backhoes for a project the scale of a Times Beach excavation is a very inefficient utilization of manpower and equipment.**

The approach and equipment described in the feasibility study is similar to that used by EPA in successful removal operations at TCDD sites in Missouri. Other approaches may be considered during predesign and design of the selected alternative.

> **Strong opposition will be encountered if Missouri TCDD contaminated soils are shipped to a disposal site in another state. Additionally, there are no permitted offsite disposal facilities available at this time. These problems combined with the tremendous cost to transport this material to an offsite facility should preclude further**

> **consideration of this approach.**

Alternatives for remediation of dioxin-contaminated soil are evaluated in the feasibility study on the basis of both cost and non-cost factors. The costs to transport the soil were included in the cost estimates. Concerns regarding the availability of facilities were noted in the feasibility study.

> **EPA proposes to require that the offsite land disposal facility be permitted under RCRA. The commentor considers these requirements to be overly restrictive...**

Use of a fully permitted facility for offsite land disposal is clearly required by the provisions of SARA, and the RCRA regulations.

> **Containers of any sort are unnecessary to an efficiently designed disposal or treatment scheme. All handling or excavated soil should be performed in bulk. Any transport or storage can be performed in bulk at a much lower cost and with less potential exposure to remediation workers. ...all container purchase, handling expenses, decontamination costs and disposal costs are eliminated.**

Containers would be used as required to implement disposal or treatment operations. The use of containerized versus bulk handling would be evaluated in detail during the design of the selected alternative. There are many issues involved with soil handling, including risks of exposure to dioxin-contaminated soil by site workers and the public.

> **Semi-bulk sacks have a relatively short useful life. When used in this storage mode, they could not be expected to last more than a few years without seam failures.**

Semi-bulk sacks have been used with success by EPA in removal operations at dioxin sites in Missouri. Seam failures have not been a significant problem to date with stored material, are not expected to be a problem during the interim period that the material is being stored. Various methods of interim storage would be considered during the predesign of the selected alternative for Times Beach.

Appendix A--Site Background Information

> **...existing sampling data is not sufficient to**

> **serve as a basis for remediation. Since the goal of the sampling was to "detect," rather than characterize or represent, the contamination on site, sample locations were selected with considerable bias....additional sampling would be necessary to define the extent of excavation necessary.**

Additional sampling and analysis will be required prior to site remediation.

> **...soil samples "representing" an entire city block were composited from materials taken from both sides of the road, along the shoulders and in drainage ditches. The usage of the term "representing" is inappropriate because sampling was "detective" in nature...**

The overall sampling program was detective in nature. However, the sampling for specific areas was considered to be representative of that area.

> **...negative results should be given as much credence as the few positive analyses and should generally demonstrate that storm water run-off is not a concern.**

> **...seven sediment samples were collected. Of these, only three were found to contain TCDD and these were very low levels (0.42 ppb to 0.79 ppb). These data further substantiate that erosion and storm water run-off is not a significant concern.**

Stormwater is of concern, particularly when positive dioxin results have been encountered in several storm water sediment samples. Higher dioxin levels have been detected in subsequent storm water sediment sampling, and results are presented in the feasibility study.

> **...most of the contamination is confined above one foot depth. These support the concept that limited excavation, not exceeding one foot depth, is entirely responsive to the NCP requirements...**

The degree of remediation required must be compatible with the cleanup requirements established on the basis of recommendations of appropriate governmental health agencies.

> **The report states that the sources of TCDD in the Meramec River are believed to be run-off from Times**

> **Beach, Castlewood, and Romaine Creek, and possible leachate from the Redbird-Simpson landfill. The report also states that no TCDD was detected in any of the Meramec River tributary sediments except those from Romaine Creek (0.3 to 0.5 ppt). The report fails to recognize that the Meramec River drains a significant portion of metropolitan St. Louis....a number of other contaminant sources would be expected.**

The cited report, "Follow-up Investigation of the Meramec River", does not support that Times Beach is a significant source of dioxin into the Meramec River. Other dioxin sites in the Meramec River watershed are clearly contributing to contaminant levels detected. Elevated dioxin levels have been detected in biota at considerable distance upstream of the St. Louis metropolitan area.

> **...the Corps of Engineers concluded that 24 to 48 hours is the minimum time normally available for predicting flows exceeding flood stage. This statement seems to imply that no knowledge of flooding potential exists prior to the actual flood. This is an erroneous inference,...the probability of a given flood may be assessed at any point in time.**

Although the potential for flooding can be estimated for remedial purposes and predicted ruing the occurrence of storm events, sufficient warning is not available to allow elimination of flood protection measures.

> **Interim actions taken by EPA in 1983 (surfacing of unpaved contaminated road shoulders and parking lots with asphalt pavement) were overly costly and generally unnecessary. Simply fencing many sites would have been adequate to prevent exposure and thereby eliminate risk.**

Response Actions taken by EPA in 1983 were determined to be necessary to provide short-term protection of public health. These actions were justified at the time of implementation on the basis of available data and recommendations from federal and state health agencies.

> **It is stated that vertical movement of the surface water with soil particles from the Minker site into the limestone is conceivable, but cites no rationale regarding why this is believed to be so. In the absence of well defined swallow holes in the creek bed, this type of movement would not be expected to occur.**

Previous hydrogeologic studies of Romaine Creek have determined that surface and ground water in the area are hydraulically connected. A dye study performed has identified a tracer compound introduced into Romaine Creek emerging at a distant spring.

> **...Sontag Road would require some upgrading to accommodate the truck traffic. The recommended modification is 2 1/2 to 3 inches of asphalt overlay. It is very inefficient to overlay the actual area to be remediated for use as a haul road. A much better solution would be to construct a parallel haul road to accommodate truck traffic.**
>
> **Upgrading of county roads...with 3 to 4 inches of asphalt overlay to accommodate the anticipated truck traffic is excessive...arbitrarily upgrading roads to a much improved condition is improper use of CERCLA funding. A better procedure would be to split traffic between the alternate routes in order to minimize damage to any one route.**

Such alternatives would be more closely considered during the design phase of the project. If paving is required and cost-effective, it would be used as required to implement the selected remedial alternative.

Appendix B--Public Health and Environmental Assessment

> **The literature published within the last two to three years, most of which has been referenced in this feasibility study, should have a dramatic impact on the ultimate conclusion to this report and the health risks presumably associated with each of the various cleanup alternatives. All pertinent available information on TCDD should be considered in developing an appropriate assessment. A number of key articles, not only on TCDD, but on the other chemicals which are reportedly of concern in Times Beach, have been overlooked.**

It is suggested that most of the literature published in the last several years has been referenced in the feasibility study, yet a number of key articles have been overlooked. The information pertinent to dioxin was thoroughly reviewed during preparation of the feasibility study, and is referenced in the feasibility study. Additional publications provided by the commentor have been considered prior to final remedy selection.

> **The commentor stated that the following statement should be substituted for a statement in the feasibility study regarding site geology: "The**

> **alluvium beneath Times Beach ranges up to 60 feet in thickness. Alluvium consists of unconsolidated material deposited by floodwaters. Material directly beneath the surface at Times Beach are younger alluvial sediments ranging in thickness from 18 to 40 feet and composed primarily of silts and clays."**

The statement made in the feasibility study is accurate.

> **It is inappropriate to base the risk assessment conclusions on calculations which use a single positive value as the anticipated average human exposure.**

As noted in the feasibility study the results of calculations in the feasibility study represent conservative estimates of risk. This approach is consistent with the guidelines of the Superfund Public Health Evaluation Manual.

> **Insert the following directly after the word "depth": "The 0 to 2 inch surface sample corresponding to this highest concentration, however, yielded a concentration of 4.6 ug/kg. Consequently, even the highest value detected on site presents no direct threat to public health or the environment since present exposure is limited to surficial materials." The fact that the average depth of highest TCDD levels was approximately 6 inches suggests that the intent of the National Contingency Plan (i.e. reducing of the threat, if any exists, to public health and the environment to an acceptable level) could be accomplished by minimal soil excavation, although this is not the exclusive remedy.**

As noted previously, EPA has relied upon the recommendations of appropriate State and Federal Health Agencies in establishing the degree of remediation required for Times Beach. Other available information regarding acceptable cleanup levels, including the material received by the Agency during the public comment period, has been considered in making this determination.

> **The distinction between alluvial groundwater and deep groundwater should be drawn. Very few, if any, persons in this area actually drink from the shallow aquifers, whereas many more persons surely drank from the lower aquifers which apparently were not contaminated.**

This distinction was identified in the feasibility study. Although the points made by the commentor are accurate, since the

> **It is important that the phenomenon of dermal absorption be considered in risk calculations.**

Dermal absorption may be an important phenomenon in some situations. The risk estimates for the Times Beach site presented in the feasibility study assume however that the potential for dermal absorption of dioxin would be limited.

> **"Animal studies have also demonstrated that TCDD is teratogenic (causes malformities) and fetotoxic (toxic to fetus) in mice, rats, rabbits, and ferrets. It is fetotoxic in monkeys."**
>
> **Although this statement is technically true, it is unduly alarming, since most chemicals have been shown to cause developmental effects in numerous animal species when sufficiently high doses are administered.**

The statement in the feasibility study is technically correct, and should not be considered unduly alarming.

> **The feasibility study states that TCDD is the most potent animal carcinogen evaluated to date by the EPA Carcinogen Assessment Group. This statement is misleading and inappropriate. TCDD is not a potent carcinogen if one considers its carcinogenicity relative to its acute toxicity.**

The statement made in the feasibility study is technically correct. When considered on a unit risk basis, the cancer potencies of different chemicals can be compared. On the basis of a relative potency index of the 55 chemicals that CAG has evaluated, TCDD is the most potent carcinogen.

> **The fact that TCDD is 50 times as potent as BCME is irrelevant since exposure to BCME at one point was relatively common in several of the chemical industries yet exposure to TCDD is rare. There still is no evidence that TCDD is a human carcinogen after 40 years of workplace experience with it.**

It is suggested by the commentor that there is no evidence that TCDD is a human carcinogen after 40 years of workplace experience, but also acknowledged that exposure to TCDD in the workplace is rare. The potency of TCDD relative to BCME is relevant and technically correct.

> **Under the current EPA classification scheme TCDD might be regarded technically as a probable human carcinogen at sufficiently high doses and with sufficient duration of exposure. However, it is**

> **also important to note that the International Agency for Research on Cancer has concluded that there is insufficient data to suggest that TCDD is a human carcinogen. It is likely when the IARC re-evaluates the relevant data on TCDD, it will conclude that the data continue to be insufficient to suggest that TCDD is carcinogenic to humans.**

The current EPA classification scheme is used to assess the risks involved with dioxin exposure. It is inappropriate to conjecture about future decisions that might be made by IARC regarding cancer potency.

> **The doses to which people have been exposed in numerous industrial accidents, and in Seveso, are far higher than those occurring in Times Beach.**

This may be true for some instances of acute exposure to dioxin.

> **Fundamentally, 1,1,2,2-tetrachloroethane, and the other chlorinated chemicals observed at this site pose virtually no hazard to man or the environment at the concentrations present. The feasibility study incorrectly reviews the hazards associated with exposure to these chemicals in the context of doses that are orders of magnitude higher than what would be encountered at Times Beach. The feasibility study should give a balanced overview of the toxicological hazards that have been observed for the chemical found at Times Beach and to identify any chemicals which may merit special considerations.**

Other non-dioxin contaminants have been detected in soils in an isolated portion of the city park, and in a portion of the groundwater samples collected onsite. As indicated in the Proposed Plan, these contaminants will be evaluated independent of the cleanup of dioxin-contaminated soils. It is appropriate for this investigation to occur independently, due to the relative magnitude of the dioxin problem, and since cleanup of the dioxin-contaminated soil should not be delayed pending an evaluation of the city park soils. Existing data indicates that non-dioxin contamination is limited to a relatively small quantity of soil in the city park area, and that ground water contaminants may be limited to a thin layer of organics on the surface of the alluvial aquifer.

It is beyond the scope for the feasibility study to develop detailed toxicological profiles for other contaminants present onsite since TCDD was the primary contaminant of concern. EPA relies on other health assessment evaluations to determine the toxicological profiles for such development. These documents, which themselves reference other health assessment documents, were referenced in the feasibility study and should be consulted for additional information.

The feasibility study properly identified the chemicals that merited additional consideration. The rationale for selection of chemicals for additional consideration is explained in the feasibility study.

> **A well-designed remediation plan needs to take into consideration the physical properties of the chemical contaminant, especially when such properties are important to designing a cost-effective cleanup.**

These types of plans will be developed during the design phase prior to implementation.

> **The feasibility study states: "Organic contamination was found in several alluvial groundwater samples on the site. Therefore, if the alluvial groundwater were used as a potable water supply, there is a potential for users to be exposed to contaminants through ingestion, inhalation of volatiles (from use during bathing or cooking), and dermal absorption (during direct contact activities such as bathing)."**
>
> **This observation is accurate only if the alluvial groundwater were a potable drinking water supply for a residential community. However, as discussed early in the feasibility study, there are no plans for this site to be used as a residential area. Further, virtually no one in America currently takes their drinking water from shallow water aquifers due to quality and seasonal variations in availability.**

Comments regarding the assumption that Times Beach could be used as a residential area in the future have been responded to previously. EPA disagrees with the statement that virtually no one in America currently takes their drinking water from shallow aquifers.

> **Because of the low quantities of organics present under the road bed and in the City Park (the source of the samples), the effect on surrounding drinking water alluvium would be negligible.**

As noted in the feasibility study, remedial investigations have not clearly identified the degree of contamination by other contaminants.

> **Since quantities and concentrations of TCDD at the site will not increase in the future, it is unlikely that fish from the Meramec River will ever exceed the advisory level.**

Existing data do not indicate that excessive dioxin levels in biota are occurring due to release into the Meramec from Times Beach. However, it is reasonable to expect that some degree of contaminated sediment may be released to the Meramec River during storm events, particularly during flood conditions. Due to bioaccumulation rates as high as 30,000 reported in the literature, any release of dioxin into the Meramec Ricer would warrant concern.

> **Dermal contact with contaminated soils or sediments that have moved offsite due to flooding or erosion would be negligible. Consequently, the combined exposure pathways would not be expected to pose a human health concern.**

Dermal contact with contaminated soils or sediments that have moved offsite due to migration was not evaluated in the feasibility study as a significant pathway of exposure.

> **The minimal amount of organics that could be leached from under road beds and the City Park is markedly limited by the adsorption of the organics to the soil. As noted in other places in the feasibility study, these chemicals are rapidly volatilized or photodegraded in water and therefore would not pose a hazard to fish through bioaccumulation. These chemicals are not bioaccumulated to a large extent due to the ability of the fish and aquatic microbes to metabolize them.**

As noted in the feasibility study, exposure to other organic contaminants from the site via the Meramec River is not considered to be a significant exposure pathway.

> **While exposure could potentially occur offsite, this concern is negligible. Considering that the TCDD concentration in soil which has the potential to migrate offsite (surface soil) is extremely low due to rapid losses from volatilization and photodegradation, the possibility of TCDD exposure offsite is remote.**

It was concluded in the feasibility study that offsite migration of dioxin does not present a significant exposure pathway. However, volatization and photodegradation have not been determined to effectively reduce surface dioxin concentrations to an acceptable degree.

> **It is unclear why the inhalation exposure pathway needs to be reviewed in each of the various sections of the report since it has already been established that inhalation is not a significant route of entry. TCDD is not very volatile. The particles to which it is bound are not readily airborne. Moreover, adsorption onto particles impedes TCDD's bioavailability. Thus, all the data indicate that the concern for the inhalation pathway should be negligible.**

It was concluded in the feasibility study that offsite migration of TCDD does not present a significant exposure pathway. It is not accurate to state that the particles to which dioxin is bound are not readily airborne. The analysis presented in the feasibility study estimates the risks posed by inhalation of dioxin-contaminated particulates.

> **The conversion of Times Beach to an agricultural setting is inappropriate. Moreover, exposure assessments presented herein indicate that the risk to farm workers would be low.**

EPA is not recommending that the site be converted to agricultural use. Since much of the surrounding area is agricultural, it is considered appropriate to evaluate the risks posed by such a use of the site.

> **The commentor agrees that the likelihood that Times Beach will become a future residential area is very remote.**

As noted previously, EPA does not believe that future residential use of the site is likely.

> **The feasibility study states: "This assessment assumes that any exposure to a carcinogen could result in cancer."**

This statement refers to the assumption of linearity for low levels of exposure to dioxin. As noted, EPA believes that any exposure to a carcinogen could result in an increased risk of cancer.

> **Several hundred soil and water samples have been collected at Times Beach. It is inconceivable that**

> **the highest samples would be used to estimate a feasibility worst-case level of exposure at the site. Certainly a more representative TCDD surface concentration that people may be exposed to would be the average TCDD concentration of less than 5 ppb rather than the single highest value measured under pavement in Times Beach.**
>
> **The most reasonable and scientific approach to the assessment would be to take the geometric mean value of the TCDD contamination at the soil surface, since it is the average concentration which will dictate the potential average human uptake via the three routes of entry.**

This comment has been responded to previously. The feasibility study evaluates upper bound estimates of risk and notes this assumption in the feasibility study. This approach is consistent with the guidelines of the Superfund Public Health Evaluation Manual. It is inappropriate to portray geometric mean dioxin concentrations as actual average concentrations that would be encountered. The average concentrations that would contribute to the estimates of risk are unknown.

> **It is unclear why a method which results in an overestimate of the contaminant concentration in air would be used when inhalation is probably the best understood of all the routes of entry.**

The methods used in the feasibility study to make a conservative estimate of risk due to inhalation are appropriate.

> **Throughout the feasibility study, it is unclear what concentration of dust in air was used in the calculations.**

It is stated explicitly in the feasibility study that an assumed airborne dust concentration is 75 microgram/cubic meters.

> **A number of comments were made regarding ambient levels of dust that could be expected, bioavailability, inhalation, and half-life.**

These points are irrelevant to the calculations that were made since the upper bound estimates were based on the the maximum concentration of dioxin at the site that has been detected.

> **These assumptions are too conservative for this setting. For example, even if an industrial use were to be assumed for this property (which the feasibility study is not considering as an alternative), the water supply would not be from the shallow alluvial water table. Any water supply**

> **that would be used by an industry would surely come from the deep aquifer which has not been shown to be contaminated with any of these chemicals.**

The risks that were estimated were based on the assumptions noted in the text. The risks were conservatively estimated for a case where the shallow aquifer was used for drinking water.

> **The term "carcinogen" does not apply, in a strict sense, to trichloroethene (trichloroethylene) and 1,1,2,2-tetrachloroethane.**

The use of the term "carcinogen" is consistent with CAG's assessment of the chemicals.

> **It should not be assumed that all workers involved in agricultural activities will be exposed to airborne dust derived from contaminated soil. Such procedure would seriously overestimate actual exposure.**

It was assumed in the assessment presented in the feasibility study that all activities could result in the generation of dust, but not that all workers would necessarily be exposed to these concentrations.

> **The feasibility study states: "Due to the nature of the work, it is assumed that the workers will ingest 0.05 to 0.1 g/day of soil through hand-to-mouth activities."**
>
> **Although these values may be accurate, when they are multiplied by the indefensible 1200 ppb value, they yield a grossly exaggerated estimate of the hazard.**

As stated previously, the public health evaluation presented in the feasibility study provides a conservative estimate of risk in accordance with Agency policy and guidelines.

> **This approach to estimating the potential hazard presented by recreational settings dramatically overestimates the likely risk. Although it is possible that persons might recreationally use the site 34 days of the year (as suggested in the feasibility study), this is highly unlikely. It is ever more unlikely that on each of the days a child visits the site, he would ingest an average of 0.1 g/day of soil due to hand-to-mouth activity.**

The risks that were estimated were based on the assumptions noted in the text. As noted in the feasibility study, the risks estimated are considered to be conservative estimates of risk.

> **We would suggest that the value in the feasibility study be revisited with an emphasis on changing the 1200 ppb figure to 2.5 ppb, which is the average surface soil concentration of TCDD at Times Beach.**

The actual average surface soil concentration is not known. The statement made by the commentor contradicts points made that the sampling done at Times Beach was intended to find the most likely areas of contamination and does not represent a true average.

> **The feasibility study states: "TCDD is toxic to a wide variety of animals". This statement is misleading in light of the levels of TCDD at Times Beach.**

The statements made in the feasibility study are technically accurate.

> **The commentor made several comments regarding the exposure of animals and plants to TCDD.**

As noted in the feasibility study, risks cannot be accurately estimated for plants and animals. Calculations were not performed for the risk to plants and animals. A qualitative discussion was provided.

> **The feasibility study states: "The cancer potency value (used in this feasibility study) is defined as the upper 95 percent confidence limit on the response per unit intake of a chemical over a lifetime (i.e., it is the slope of the dose response and it represents only a 5 percent chance that the probability of a response could be greater than the estimated value for the experimental data used). This is a conservative approach and may overestimate the actual risk."**

The feasibility study uses the CAG cancer potency values for estimating risks due to dioxin exposure. It was noted in the feasibility study that the use of the CAG cancer potency was a conservative approach and may overestimate the risk.

> **A major difficulty with the use of the cancer potency value in the feasibility study is that it concludes with a single number without indicating its extraordinarily conservative nature.**

The feasibility study states: "Potential risks were developed using maximum contaminant levels at the site; therefore, they represent worse-case risk estimates."

> **The feasibility study states: "Carcinogen risks from inhalation of dusts potentially contaminated with TCDD cannot be calculated because TCDD has no cancer potency value through the inhalation route."**

Carcinogenic risks due to inhalation were estimated based on the subsequent ingestion of particles following inhalation. Estimates due to inhalation alone could not be made because cancer potency values due to inhalation are not available from CAG.

> **The risk estimated for these guards is excessive. It should be corrected for only two hours of exposure per day. It can be determined how many minutes per day they spend in the car, and outside the car, and if the various guards rotate the patrol duty of the Times Beach area.**

The assumptions noted in the feasibility study are appropriate for a conservative estimate of risk.

> **.... The generalized form of the calculations presented on Page B-6-4 is insufficient to allow a complete scientific review of the appropriateness of the mathematics. For instance, it is not clear what dust concentration in air was used in these calculations.**

The methodology used to estimate risks is presented in the feasibility study. Dust levels assumed have been previously defined, and are noted in the feasibility study.

> **The question is what level of clean-up is needed to protect human health and the environment. This question can be answered only by the application of clear, objective scientific analysis.**

EPA has relied upon the judgment of appropriate state and federal health agencies including the Centers for Disease Control and the Missouri Division of Health in determining the level of clean-up that is required for sites such as Times Beach. These agencies use scientific analysis to determine appropriate cleanup levels.

> **The current headings of the three columns regarding**

> **the conservatism or the lack of conservatism of the various assumptions are too gross to be of much benefit to the risk assessment in ultimately deciding whether the results are more likely than not to be overstated.**

The information presented in the feasibility study is appropriate to evaluate the results of the risk assessment. The approach is consistent with the guidelines of the Superfund Public Health Evaluation Manual for evaluating such information.

> **The bounding procedure on the multi-stage model will almost certainly overestimate the risks. The overestimation is no less than a factor of 10 and may be as high as 10,000.**

The feasibility study notes that the cancer potencies that were used would tend to overestimate the risks.

> **"Calculation for chemical ingestion assumes 100% absorption into the body. The actual percentage absorbed may be less."**
>
> **The feasibility study should state that this will, by definition, overestimate the risks.**

The assumption of 100 percent absorption would conservatively overestimate the risk.

> **This feasibility study states: "The exposure to and concentration of contaminants at exposure points is held constant over a 70-year lifetime. Chemical fate and transport mechanisms may alter actual concentrations which may vary with time." This uncertainty greatly overestimates risk.**

The risk identified in the feasibility study would more likely be conservatively overestimated than underestimated.

> **The feasibility study states: "Cancer potencies and acceptable intake levels are primarily derived using laboratory animals studies and, when available, human occupational studies. Extrapolation of data from high to low dose, from one species to another, and from one exposure route to another introduces uncertainty."**

It is not accurate to assume that uncertainty can only introduce bias which would result in overestimation of the risk. The statement made in the feasibility study is correct.

> **There is no more conservative approach to the assessment of carcinogenic risks than that which**

> **has already been applied. It would thus seem that these procedures can only overestimate the actual risks.**

> **Although not all the chemicals found onsite have been assigned cancer potencies or acceptable intake values, these same chemicals are not present at Levels of Concern. Since the presence of these chemicals poses a de minimus risk, it is inappropriate to state that this uncertainty would markedly underestimate the risk.**

The statements appearing in the feasibility study are correct. The risks presented may be overestimated or underestimated. It is the position of EPA that a conservative approach should be applied to the determination of risk in order to assure the protection of human health with a high degree of confidence.

> **The feasibility study indicates that the methodology for the exposure assessment involves considerable uncertainties. In order to assess the validity of the methodology, at least the range of uncertainty should be indicated.**

The approach is consistent with the guidelines of the Superfund Public Health Evaluation Manual for presenting the results of the risk assessment.

> **If the CAG carcinogenicity potency factors are to be used in estimating cancer risks, a discussion of the underlying rationale which explains the derivation of these factors should be included.**

A discussion of such rationale is beyond the scope of the feasibility study.

> **The feasibility study indicates that children ingest 0.1 gram of soil per day. There are no references supporting this value.**

This value is based on a thorough review of the literature. References will be provided to the commentor.

> **While on p. B-5-21 the feasibility study indicates that adults ingest 50 mg/day, line 16 of Attachment B-1-2 feasibility study indicates that adults ingest 100 mg/day. Whichever value is used, it should be consistent throughout the document.**

As noted in the feasibility study, both values were used to estimate a range of risk. The example in the appendix assumed 100 mg/day.

> **Finally, the body weight of adult males from ages 19 to 60 is closer to 80 kg than 70 kg.**

Exposure to dioxin contaminated soil would not be limited to males. Therefore, using an average body weight that assumed such exposure would be inappropriate since it would not take into account a significant group of potentially exposed persons. The assumption used in the feasibility study is appropriate.

> **It is highly unlikely that individuals will be visiting Times Beach on such a regular basis from ages 5 to 60.**

The assumptions noted in the feasibility study are appropriate for a conservative estimate of risk.

> **According to Table B-5-2 (and elsewhere in the feasibility study), the estimated airborne TCDD concentration is 0.00009 mg/m^3. This is based upon the use of a TCDD soil concentration of 1200 ppb (the maximum level measured anywhere in Times Beach) and an airborne dust concentration of 75 mg/m^3.**

The 75 mg dust/m^3 is a reasonable value for total suspended particulates (TSP) in urban areas.

The commentor has clearly identified the assumptions in this comment. EPA, therefore, believes that the number was clearly identified.

> **The feasibility study reported lifetime average inhalation rate (LAAI) for the occupational setting of 0.014 g/kg/day. This value is based on an inhalation rate of 20 m^3/day. It should be based on an 8-hour day rather than a 24-hour day.**

The hourly rate for lifetime average inhalation was used for calculation purposes. That rate was based on an adjusted value for the daily inhalation rate. The value of 0.014 g/kg/day was incorrectly reported and has been noted. The values that were used in the calculations were otherwise correctly cited in the text.

> **This section deals with intake from inhalation exposure. Since only a portion of inhaled dust is ultimately ingested and the G.I. absorption coefficient is not 100%, a term should be introduced into the equation to estimate the fraction of contaminant which is absorbed via the G.I. after inhalation exposure.**

The assumption of 30 percent absorption was cited in the section cited by the commentor. As noted previously, substantially higher absorption rates have been determined for dioxin in Missouri soils. The feasibility study calculations provide a conservative estimate of risk.

> **A term for gastrointestinal absorption of noncarcinogens found in ingested soil is present in the proposed equation. Unless absorption is 100%, a term should be introduced into the equation to reflect that fraction of ingested contaminant which is ultimately absorbed.**

It should be noted that, even assuming 100 percent absorption, the calculated concentrations did not exceed acceptable intakes.

> **In the presence of a mixture of noncarcinogens at the concentrations found at Times Beach, the Hazard Index concept does not apply. Thus, the overly conservative approach of estimating exposure to each chemical is compounded further by the use of the Hazard Index concept.**

The use of hazard index is not affected by the concentration of chemicals that are present.

Appendix C--Review of Research and TCDD Treatment Technology

> **...TCDD does not have an affinity for water.**

It is correct that dioxin has a limited affinity for water.

> **...the possibility of co-solvents existing in high enough concentrations in the groundwater to increase TCDD mobility is very remote.**

The issue discussed in this paragraph was the presence of co-solvents in soil. Their presence in groundwater is not relevant to the discussion presented in the feasibility study. The mobility of dioxin in soil is affected by the presence of co-solvents that will increase mobility.

> **The objective of field tests conducted during the second half of 1985...was to demonstrate whether the [incineration] process has any long term operational limitations and provide information on the cost of the process. ...unit treatment costs were in excess of $1,000 per yd^3 and the on-line time was less than 50 percent. These figures call into question the commercial viability of this technology for this application. Subsequent field work was performed during 1986 and demonstrated that substantial operational problems were**

encountered.

The Denney Farm work was a trial, thus many costs that were encountered would not be expected for a remedial operation. As previously discussed, the EPA mobile incinerator was not originally designed or constructed for treatment of soils. Operational problems that were encountered were typical of the startup of any new process and have been corrected through several modifications being made to the unit.

IT Corporation's work proves that TCDD can be volatilized from soil by indirectly heating the soil to an optimum temperature.

IT Corporation's work indicates that dioxin can be volatilized from some soils, but does not indicate that this will be generally true for all soils or to the degree that is necessary for remediation.

The EPA Mobile incinerator studies demonstrate that volatilized TCDD vapors can be destroyed in a secondary combustion chamber.

It should be noted that the secondary combustion chamber must be properly designed and operated for this to occur.

The capital and operating costs of this thermal processor are substantially lower than the rotary kiln technology described in the feasibility study, yet the Shirco infrared approach was inappropriately eliminated from further consideration.

As noted in the text, the Shirco unit was not "eliminated from consideration." Such a unit could be proposed and evaluated for use at Times Beach.

A better air pollution control device (APCD) is a high temperature bag house as described in the Norris Report. For the TCDD-contaminated soil found in Missouri, this is an acceptable APCD in regards to the 4 lb/hr HCl emission rate that would be allowable if RCRA applies.

A high-temperature baghouse could be proposed by thermal treatment service companies and evaluated for use at Times Beach during the design phase of the project.

A transportable modular unit could incorporate significant design improvements such as particulate removal between the incinerator and afterburner and still satisfy the transportable (shippable) requirement. Installation and dismantling times

> **will not be significantly different than for a mobile unit.**

This is an accurate statement. Selection of specific thermal treatment equipment will be the responsibility of the companies submitting proposals for the project.

> **The first sentence in this sub-heading states, "The RKI is highly suitable for treating TCDD-contaminated soil." The commentor disagrees. In fact, the specific nature of the contamination at this site requires a unit designed to handle low BTU soils at maximum efficiency, which the RKI does not.**

The RKI has been demonstrated on dioxin-contaminated soils. It has been demonstrated that the RKI is capable of achieving DRE's exceeding 99.9999 percent. This would indicate that the technology is highly suitable for treating dioxin-contaminated soils.

> **Totally omitted from the discussion is an evaluation of comparative thermal treatment costs, which are required to be considered under the NCP.**

The NCP does not require that all of the variations of a particular treatment technology be compared in the feasibility study. It is only necessary to compare the costs of different remedial alternatives.

> **The second sentence under this sub-heading states, "Low BTU wastes, such as soil, can be sprayed with fuel oil while being fed into the incinerator to produce a heating value of 500 to 2,500 BTU per pound and to increase the throughput rate." Fuel oil used in this manner will increase purge gas flows through the primary chamber, requiring a larger afterburner and probably particulate removal between the primary chamber and after burner.**

Purge gas rates could be increased resulting in additional requirements such as these mentioned. An analysis of the cost-effectiveness of supplementing the primary source of combustion must consider the entire process.

> **With its anticipated unit cost, which is substantially lower than the $400 to $600/yd^3 that the feasibility study presents as an estimate of the RKI cost, and its successful trial run at Times Beach, the EII system merits greater consideration than received in the feasibility study.**

Alternate thermal treatment technology will be considered during the design phase of the project if proposed by service companies. The feasibility study does not rule out the use of EII technology.

> **"A 1-ton-per-hour pilot unit was tested extensively on surrogate PCB and dioxin wastes..., achieving 'six 9's DRE from FRR alone." This suggests that the operating temperatures which are currently being used (1800 F in the rotary kiln and 2200 F in the after burner) are excessive and can be safely reduced...**

This indicates that surrogate PCB and dioxin wastes may be thermally treated, but does not indicate that the operating temperatures currently being used for treatment of dioxin-contaminated sites in Missouri are excessive.

> **Reference is made to IT Corporation's work at Gulfport, Miss. where an indirect-fired rotary kiln reduced soil concentrations of TCDD from 250 ppb to less than 1 ppb. The test by Shirco Infrared Systems at Times Beach is further evidence on a small scale that indirect heating successfully volatilizes TCDD from soil. ...these experiences indicate that the indirect-fired rotary kiln technology is a viable alternative for any soil volume that must be incinerated.**

The tests by Shirco indicate that infrared technology may be a viable technology for thermal treatment of dioxin-contaminated soil.

> **The biggest advantage for the indirect-fired rotary kiln is the low purge gas flow through the unit. This reduces, not increases, capital costs as stated in the feasibility study...**

One potential advantage of an indirect-fired system would be low purge gas flows.

> **...the combustion gases exhausting from the indirect-fired rotary kiln's jacket are clean and available for use to preheat soil and combustion air, or for energy recovery.**

This represents another potential feature of the technology described.

> **Previous work by IT Corporation at Gulfport, Miss. (pages C-8, C-9) has proven the concept of TCDD volatilization from soil.**

Although IT Corporation's work is promising, the specific conditions at the Times Beach site must be considered to evaluate fully the concept of dioxin volatilization.

> **...lower volatilization and decomposition temperatures can assure TCDD destruction. Therefore, permitting (if necessary) should not be any more difficult than for other systems.**

Performance-based specifications will be developed during design which assure that all permitting and other regulatory requirements are achieved by the remedy.

> **Available scientific literature does not support the need to clean items which are contaminated up to levels of 1000 picograms per square meter.**

The level of cleanup required would be determined through the recommendations of state and federal health agencies.

> **No sampling or clean-up is necessary for any structures which are to be placed in a demolition landfill.**

As previously stated, testing of structures and debris would be required prior to disposal to confirm that this material can be disposed of as non-hazardous solid waste. Decontamination would be required if testing determines that the structures are contaminated.

> **A cost benefit analysis should be performed to determine whether the salvage value justifies the expense of decontamination. Decontamination should take place only where salvage value significantly exceeds decontamination cost.**

Previous testing at Times Beach has indicated that structures and debris located onsite are not contaminated and can be salvaged or disposed of as non-hazardous solid waste. If it is found that a portion of this material is contaminated, the economies of performing decontamination would be evaluated to determine if salvage operations are cost-effective. Such an analysis would be performed at the predesign stage of the site remediation operations.

> **Available data do not indicate that Level C personal protection will be required at Times**

Beach.

The level of protection described in the feasibility study is similar to that used for removal operations at other TCDD sites in Missouri and is based on the recommendations from federal and state health agencies.

> **The feasibility study has dramatically overstated the decreased efficiency from the use of this level of personal protective equipment and this overstatement has greatly inflated EPA's cost estimates for this work.**

The decreased efficiency due to the use of personal protective gear, which is a result of frequent rest periods, the necessity for decontamination and suiting up, and the cumbersome nature of the equipment is documented. The estimates used in the study are based on observations during actual remedial operations.

> **When personal protective equipment is not necessary, it should not be used since it may unduly stress the cardiopulmonary system as well as increase the likelihood of heat stress. The cumbersomeness to employees of unnecessarily restrictive equipment should be avoided to preserve good employee morale.**

The level of protection required would be determined through consultation with appropriate state and federal health agencies. The level of protection that would be used would protect against exposure to dioxin at levels that would present a risk to the health of the worker.

Section 6--Times Beach Feasibility Study

> **Sampling to date at sites where remedial excavation activities are progressing indicates no offsite TCDD migration of airborne dust. Similar sampling at idle sites duplicates these results, obviating the need for an extensive particulate sampling program.**
>
> **A single phase particulate and sediment monitoring approach should be adequate.**

The details of the air monitoring program would be arranged during design of the selected alternative. As noted by the commentor, air monitoring is being performed at other TCDD removal sites. This sampling has verified that dust management programs have been effective. Similar programs would be used at Times Beach to ensure that dust migration was similarly controlled. Continuous air monitoring would be necessary to assure the safety of workers and local community.

> **Air monitors, if absolutely required, should be located downwind in the prevailing wind direction and/or at the boundary of the closest point of routine public habitation. Sediment monitors should be located in drainage ditches which drain offsite from contaminated areas.**

The details of air and sediment monitoring programs would be addressed during the design of the program for the selected alternative. Issues addressed by the commentor would receive greater consideration at that time.

> **Proposals to erect additional fencing, post warning signs and eliminate the services of the 24-hour site security personnel are cost effective and sensible measures....cost estimates for implementing these measures have included maintenance and repair of the fence.**

Measures to reduce the long-term costs associated with onsite security could be cost-effective. The need for continued security will be determined in consideration of the selected remedy.

> **(It is proposed that) sediment barriers be placed in the major drainage ditches to provide rough sediment deposition. It would be more reasonable to monitor initially the sediment in existing drainage ditches and only install sediment barriers in the unlikely event that the sediment is demonstrated to be contaminated. The trigger point for the installation of the barriers needs to be defined by a reasonable assessment of the risk to health and the environment.**

Sediment barriers would be installed as required to prevent contaminated sediments for leaving the site at levels considered by federal and state health agencies to present a public health or environmental risk.

> **The construction of temporary equipment storage facilities which must undergo expensive decontamination procedures following completion of the project seems extravagant and not justified.**

> **Only the minimum amount of equipment and personnel should be employed to complete installation of the caps.**

Temporary equipment storage facilities would be constructed as required to protect equipment used at the site. The amount of equipment and personnel used would be adequate to implement the selected alternative in the time required to complete the project work.

> **Studies have shown that vegetation does not normally absorb TCDD, so that if the vegetation is simply mulched and left in place, the TCDD concentration, if any, would not be increased by any detectable level....the established vegetative topsoil cover would adequately prevent any TCDD migration from this site. Surface debris, such as sticks and leaves should be left in place, and not consolidated and containerized separately.**

Surface debris such as sticks and leaves would be removed as required to implement the selected alternative. If implementation of the cleanup would not be affected by the presence of a portion of this material, it will be left in place pending site restoration. This material may be removed during restoration, depending on design criteria. The need for consolidation and containerization of this material to facilitate handling will be evaluated during design.

> **There is no justification for pulverization of the pavement as discussed in the fifth paragraph. With a one foot soil cap there is sufficient depth of soil for establishment and maintenance of a dense grass cover.**

Pulverization would be performed as required to ensure that a soil cap was firmly established on the areas to be covered, if such an alternative were selected for remediation. Existing pavement is left in place in some areas in the Proposed Plan to provide an additional barrier. This barrier provides an additional measure of protection for public health and the environment, exceeding the recommendations of federal and state health agencies, at a lower cost.

> **The need for new culverts can be held to a minimum by the development of a well designed site grading and drainage plan prior to implementation of the capping program.**

New culverts, as well as site grading, may be required for implementation of any selected remedy. Such measures would be undertaken as required to control site drainage. The need for culverts could be affected by other measures such as grading.

Such issues would be considered in greater detail during the design of the selected alternative.

> **The need for an extremely expensive permanent irrigation system can be avoided by selecting appropriate dense grass mixes or other vegetation that will withstand the lack of summer rainfall, and will control erosion once established. If watering is necessary to establish initially the vegetative cover, this can be accomplished at a reduced cost by more temporary systems.**

Since the alternative is a final remedial measure, methods would be implemented to permanently ensure that the integrity of remedial measures is maintained. EPA agrees that mixes of ground cover should be selected that would be able to withstand the lack of summer rainfall and would control erosion. If such materials could be found that would meet the site objectives, the need for permanent irrigation may be reduced.

> **...disposal costs for protective equipment can be eliminated if uniforms are used that can be washed on a daily basis.**

The level of protective gear assumed in the feasibility study is similar to that used for removal activities by EPA at other TCDD sites in Missouri based upon recommendations of federal and state health agencies. If other types of protective equipment is deemed appropriate by health agencies, it may be considered for use during remedial activities at Times Beach. Such issues would be addressed during design of the selected remedial alternative.

> **...a more cost effective method of disposing of the decontamination rinse water is to utilize it for dust control at already-contaminated remediation work areas.**

This possibility will be evaluated further during design and predesign of the selected alternative.

> **In the event that EPA determines that the sand and carbon filters are nevertheless required, the filter materials should be disposed of beneath the clean topsoil cover in an area of confirmed TCDD contamination.**

This option for disposal of the filter material will be evaluated in greater detail during the predesign and design phases of the project.

> **...the ditches should be filled and a smooth, gently tapered soil covering placed over the road and road shoulders.**

Filling of ditches with clean soil would disturb site drainage characteristics. This possibility will be investigated, if appropriate, during the design phase. The feasibility study and Proposed Plan evaluate several in-place containment alternatives. Alternative designs would be considered if this remedy is selected.

> **There is no need to resample streets and ditches having composite TCDD concentrations below the Level of Concern unless the original samples and analyses were suspect. Sampling of Times Beach appears adequate.**

Additional sampling has been performed to properly define the contaminated areas and ensure that the objectives established by state and federal health agencies are met. Sampling will be conducted, as necessary, to implement the selected remedy.

> **After the implementation of "in-place containment" measures, there will be no need for long-term maintenance activities, decontamination facilities or equipment storage. On occasion, if necessary, a mowing machine can be trailer towed to the site to mow the grass cap. Purchasing and storing equipment on site increases the risk of theft or vandalism and thus should be avoided.**

This is an option for the handling of maintenance activities. The storage of equipment would be specified during design.

> **...that after the vegetative covers are established, additional inspections (following storms, winds, or floods) will not be required because this cover will effectively protect the topsoil from such events.**

There is a potential for erosion to a vegetative cap. EPA believes that it would be necessary to inspect the cap following storm, wind, and flood events to ensure that the integrity of the cap is maintained. Repairs would be made as soon as possible to endure that damage to the cap, if it occurred, did not worsen due to neglect.

> **EPA would require the use of Level D protective equipment for site preparation even though the facility would be sited in the uncontaminated trailer park area. The commentor believes that no protective equipment beyond hard hats and safety boots would be required for this work.**

The gear described by the commentor is Level D gear. Level D protective gear is primarily a work uniform that provides a minimal level of protection. The required equipment is coveralls and steel-toed leather or chemical-resistant boots or shoes. Hard hats would be optional equipment.

> **No additional fencing would be required around the site perimeter because the assigned security guards could adequately protect the site.**

Additional fencing would be installed as required to ensure that equipment is protected and intruders prevented from contacting the contaminated areas.

> **TCDD does not migrate in response to water percolating through the soil...as a consequence, the disposal facility and elaborate leachate treatment system described in the feasibility study [for the land disposal facility] is not scientifically or technically justified. Such a system is enormously expensive and requires operating costs in perpetuity.**

As noted previously, a collection and treatment system would be required for the land disposal facility. The system would be expected to operate primarily during the early portion of the project when the facility was open and being filled. After the facility had been closed, leachate generation would be expected to become negligible, except for the unusual occurrence of a breach in the cover for the facility. It would be necessary to maintain the equipment in good working order in case such an occurrence did occur.

> **...the top of the concrete walls of any onsite land disposal structure, if constructed need only be one foot above the 100 year flood elevation. This reduces the amount of borrow and backfill prior to construction, and the amount of borrow and backfill to cover completely the container.**

The specific height of the disposal facilities' walls would be selected to minimize the potential for floodwater overrunning the top of the wall.

> **The commentor recommends elimination of the "polymeric asphalt coating or synthetic liner" intended by EPA to serve as an impermeable coating for the concrete. These liners or coatings leak immediately after installation, reducing their effectiveness as an impermeable barrier. In addition, the concrete can be designed to be as impermeable to sediment transport as a liner or coating....a secondary leachate collection system will be available as a back-up system, thereby**

> **reducing the need for the liner or coating.**

Coatings or liners would be required for a permanent disposal facility. The specific coatings that would be required would be selected following additional evaluation during the design phases of the project.

> **..."leachate collected in the leak-detection system would be pumped to the leachate treatment system." The commentor does not anticipate that this measure will be required because it is unlikely that the groundwater or floodwater beneath the concrete container will be contaminated. It would be more advisable to sample this water prior to treatment to determine if treatment were necessary.**

In the event of a flood, it is unlikely that time would permit sampling and analysis of groundwater or floodwater beneath the facility. One purpose of collection and treatment would be to minimize the potential for uplift that could damage the facility.

> **The commentor disagrees with EPA that a function of the cap that covers the filled concrete disposal facility is to prevent percolation of rainwater into the contaminated soil....The major function of this cap is to prevent public exposure to the contaminated soils.**

Although a function of a cap is to prevent public exposure to contaminated soils, a cap is also intended to prevent percolation of rainwater.

> **The leachate treatment system envisioned by EPA would be capable of handling flows from a 24-hour-long, 25-year storm....a system sized to handle this volume of rainfall is not required...**

As noted previously, EPA believes that such sizing is required to prevent damage to containment facility. The specific sizing of the equipment would be determined during design of such a facility, if included in the selected remedial alternative. The proposed remedy does not include the need for a leachate collection system. Water treatment requirements will be dependent upon the design of the remedy.

> **...The commentor recommends that the TCDD removal efficiency of 99.9% of total TCDD be expressed as a discharge criteria for the treated water, such as the 10-ppt limit which EPA uses at the Denney Farm Site.**

Discharge of treated water will be in accordance with federal and state water quality laws and regulations which are determined to be applicable or relevant and appropriate.

> **Level C protection as described...would be excessive for most remediation activities. EPA Level D protection is more suitable for most of the remedial tasks and provides enhanced worker comfort and efficiency.**

The level of protection described in the feasibility study is typical of that used during removal operations at other dioxin sites in Missouri. Alternative levels would be considered if their use was approved by appropriate state and federal health agencies. These issues would receive additional consideration during the design of the selected alternative.

> **...no advantage is gained by employing steam cleaning of containers and trucks versus high pressure water spray or water spray combined with detergents. Steam cleaning is dangerous and expensive and does not remove TCDD more efficiently than these other methods.**

The specific cleaning method employed would receive additional consideration during the design of the selected alternative. Steam cleaning would minimize the amount of decontamination water requiring later treatment. Steam cleaning, as well as the other methods suggested by the commentor, would be evaluated for cost-effectiveness.

> **The commentor rejects EPA's conclusion that long-term groundwater monitoring is required after closure.**

Ground water monitoring will be performed, if required by state-issued permit conditions.

> **EPA will be requiring "...periodic inspection of the disposal facility walls for leaks, cracks, and distortion." Since these walls are buried, these inspections would require total excavation of the soil fill around the concrete facility. This is both absurd and totally cost prohibitive. No inspections should be performed unless a significant shift in the soil mound covering the container occurs.**

The passage refers to general RCRA requirements. The cost of operation and maintenance is included in the determination of cost-effectiveness for each of the remedial alternatives.

> **The only aspects of the outlined operation and maintenance activities which should be undertaken**

> **are those activities which involve maintenance of the security system and of the culverts and ditches. Leachate collection and treatment are unnecessary and consequently there will be no associated maintenance required.**

Leachate collection and treatment would be necessary for a land disposal facility, for reasons noted previously.

> **This option requires that a commercial landfill facility be located in the vicinity of Times Beach, or that an upgraded sanitary landfill be constructed and permitted. Neither of these currently exist, nor is the probability very high that such a facility will be constructed in the near future.**

It was not assumed in the feasibility study that a commercial landfill facility would be constructed in the vicinity of Times Beach. It was noted in the feasibility study that such a facility could be a considerable distance from Times Beach.

> **EPA proposes to construct an 8 foot high perimeter fence around the Times Beach site. This is an economically unjustified use of CERCLA funds because the security guards detailed to the project can adequately protect the site, and because the fencing will have to be removed following remediation efforts.**

EPA will construct fences as required to implement the remedial alternatives. The level of security that would be required should be adequate to prevent intruders from entering the site and contacting contaminated material and also prevent vandalism. Security requirements will be adjusted in consideration of the selected remedy.

> **...the maximum equipment required to protect workers from exposure to TCDD is disposable dust masks and washable clothing.**

As noted previously, the level of protection described in the feasibility study is typical of that used during removal operations at other TCDD sites in Missouri based upon recommendations of state and federal health agencies. Alternative levels would be considered if their use was approved by health agencies. These issues would receive additional consideration during the design of the selected alternative.

> **An indirect-fired rotary kiln with dry pollution control is a much preferred method of treating low level contaminated soil. This technology is less costly, more reliable than other thermal treatment**

> **techniques, and it can meet all Federal, State and local performance requirements.**

If the proposed technology is cost-effective, EPA would anticipate receiving proposals for the project incorporating its use.

> **EPA would require the installation of an 8-foot perimeter fence around the entire site. The commentor recommends that EPA only install such a fence around the thermal treatment facility because the security guards can adequately prevent unauthorized personnel from entering the site.**

Fencing would be installed as required to prevent contact with contaminated soil and prevent vandalism of equipment.

> **EPA indicates that the incinerators and ancillary equipment would require a power supply of approximately 800 kw....much less power should be required to operate the incinerators.**

The level of power noted in the feasibility study is similar to that noted by service companies operating full-scale mobile incinerators. The power requirements would be determined by the technology utilized by the successful bidder.

> **EPA estimates that approximately 28 acres would be required for the thermal treatment facility. A 28-acre site is unreasonably large due to the 4 month soil storage requirement, and the requirements for elaborate and unnecessary water treatment of the scrubber blowdown.**

EPA believes that 4 months of storage would be approximately correct for treatment of Times Beach soils only. The flood-protected acreage assumed on the Proposed Plan was substantially reduced. Actual requirements would be determined during design.

> **...there is no need to gravel the entire incinerator site.**

The site would only be graveled as required to support equipment, storage areas, and roads.

> **...design of the facility to provide protection from a 100 year flood event is inappropriate for a temporary facility projected to have a relatively short life.**

The facility will need to be flood-protected to prevent damage to facilities in the event of a flood. The incinerator, which would require a minimum of 6 weeks for dismantling, could not be removed quickly enough to prevent flood damage if a flood occurred. Hence, even though the facility would be relatively short-lived, given the nature of flooding at the site, the facility would need to be thoroughly flood protected.

> **EPA proposes to construct diked tank areas....liquid storage tanks and dikes will not be necessary if a dry air pollution control is utilized.**

Chemicals are likely to be required, even for a dry scrubbing system, so the complete elimination of diked tank areas is unlikely. A dry scrubbing system, if offered by thermal treatment service companies proposing to work on the project, would be carefully considered during the design phase for the project.

> **Because there is so little chlorinated material in the soil at Times Beach, HCl generation would not surpass the four pounds per hour allowed by RCRA. Therefore the reference to caustic storage or neutralization of HCl should be deleted.**

Caustic would likely be required for the quench process that would be required for a dry process, so it is unlikely that its use would be discontinued. If its use was not required, it would not be used.

> **EPA would construct a well producing at least 70 gpm of water to be used for scrubbing exhaust air from the secondary combustion chamber. If a dry pollution control system were utilized, this volume of water would not be required. The well would only need to supply that volume of water necessary to support the waste heat boiler system....only 40 gpm for both units would be required...**

The volume of well water required may indeed be reduced with a dry scrubbing system over a wet scrubbing system.

> **...there are three former municipal wells and a water storage tank which could be brought back into service instead of drilling a new 70 gpm well at a cost of more than $200,000.**

If the existing wells could be brought into service, supply the water needed, and be set up at a lower cost than installing a new well, the existing wells would be used.

> **A sump to store run-off from a 25-year rainfall is unnecessary [to contain stormwater within the ring levee] because EPA proposes to containerize the**

> **soil....a sump to hold 932,000 gallons of water is required, which appears to be excessively large.**

EPA believes that the assumptions noted in the feasibility study are justified. Additional consideration would be given to this issue during project design.

> **The incinerator set-up time of six weeks is unrealistically short, and the use of a second shift of set-up workers has limited effectiveness and can be very costly.**

The incinerator setup time is that suggested by several thermal treatment service companies that offer onsite mobile incineration services. Six weeks is not considered to be unrealistic. Scheduling of shifts will be the responsibility of the construction contractor.

> **EPA notes that the trial burn plan is to be submitted after the preliminary shakedown of the thermal treatment unit. A preferred approach which would minimize delay and downtime for the unit would be to submit the trial burn plan for approval during the design and construction of the unit.**

Delays would be minimized if the plan could be offered prior to preliminary shakedown of the unit.

> **There is no need to load the excavated material into 15 cubic yard bins which are estimated to cost over $9,000,000 to purchase....bins are hard to fill, require very awkward and expensive equipment to move them and do not provide any operational improvements.**

There are several advantages to the use of bins for such an operation. The specific handling method may differ from that described, however, and would be determined during design of the selected alternatives.

> **A straight line configuration of the rotary kiln and the afterburner has proven to be unfeasible at the Denney Farm due to particulate carry-over into the afterburner. A design to facilitate particulate removal must be employed.**

Modifications have been made to the EPA mobile incinerator since the Denney Farm trial that will reduce the particulate carry-over into the afterburner. Similar modifications have been made to commercially available rotary kilns. A straight-line configuration could, therefore, be used successfully.

> **The units should not remain mounted on trailers**

> **because this overly complicates their operation. They could be made transportable...**

The decision to keep the thermal treatment units trailer-mounted would be left to those proposing to perform the onsite thermal treatment services.

> **...a mobile system versus a transportable component system constructed on-site is not justified due to the very large magnitude of the project. The additional costs to construct a mobile incinerator (trailer chassis, quick connect electric systems, etc.) instead of a skid mounted transportable system are not merited for a project which will extend over several years and not several months.**

Mobile incinerators have already been constructed and are in operation. Since a new mobile incinerator would not necessarily have to be built, construction of such a unit would not necessarily be an issue for the site. Any transportable thermal treatment unit capable of satisfying the performance objectives, including mobile units, would be considered if proposed.

> **The wet scrubber unit should be replaced with a high temperature baghouse for final particulate control.**

This is a possibility, but would be left up to those proposing to offer thermal treatment services. Such a unit would be required to meet required performance objectives.

> **Additional efficiency, reduced maintenance and space requirements can be gained by using one larger incinerator instead of two smaller units.**

There may be some benefit to operating a larger incinerator over several smaller ones. Two units were assumed in the feasibility study to increase capacity. If it is cost effective to operate a single larger unit, proposals should reflect this.

> **Any excessive downtime due to having only one treatment unit can be avoided by an effective preventive maintenance program which is scheduled in advance.**

A preventive maintenance program would help reduce unscheduled downtime for the thermal treatment unit. Some unscheduled downtime would be unavoidable.

> **...the contaminated soils feed rate is listed as 8.5 cubic yards/hour...yet the footnote indicates that the mass flows given are total values typical for 6 cubic yards/hour contaminated soil feed.**

The contaminated feed rate for two mobile incinerators, based on the assumptions noted in the text, would be approximately 8.5 cubic yards/hour. This error has been noted.

> **The steam generated by the waste heat boiler should be used to preheat combustion air or to preheat the feed soil.**

The use of waste heat would be determined by the company proposing to offer the incineration services.

> **Higher heat inputs would be expected in the rotary kiln incinerator than in the afterburner. EPA should re-examine these numbers which will affect the soil treating capacity of the unit.**

The throughput of the incinerator was estimated through heat and material balance calculations using the assumptions noted in the text. The thermal limitations in the incinerator are the same as for commercially available units. As noted in the text, the throughput is affected by the moisture content of the soil that is assumed. The rates that were estimated are similar to those actually experienced in the field on low-Btu content soils. EPA expects that the rates experienced with similar soil using a similar incinerator would be close to those estimated through the rigorous heat and material balance calculations.

> **...an effective throughput of 8.5 cubic yards/hour is assumed...this effective rate is not found anywhere in Appendix E of the feasibility study where costs are estimated.**

In Appendix E, the operating cost per cubic yard of material of one incinerator is estimated. This cost is estimated at a range of throughputs, including 4.25 cubic yards per hour, which is the rate estimated though a rigorous heat and material balance. If two incinerators were used, each operating at 4.25 cubic yards per hours, the combined throughput would be 8.5 cubic yards per hour. The unit cost per cubic yard for the two incinerators would be the same as for one, and the cost per hour would approximately double.

> **...the kiln exit temperature of 1600 degrees F ....has been proven at the Denney Farm site but substantial fuel savings may be realized if this temperature could be reduced. Experimentation with this variable could drastically reduce fuel costs, by as much as $500,000 for only a 7% reduction in fuel usage. The same reasoning applies to the afterburner temperature of 2200 degrees F.**

Fuel reductions would be possible if the incinerator could be operated at lower temperatures. Such operation would not be contemplated unless it could be demonstrated that required dioxin destruction would be maintained and performance objectives met at lower temperatures.

> **In the Netherlands...a direct spray cooling system has been employed which uses water to cool the ash as well as to rehumidify the ash. This rehumidification allows the ash to be more readily land applied.**

Different options for cooling the ash would be proposed by the thermal treatment services companies proposing to work on the project. It is possible that a system similar to that suggested by the commentor could be proposed.

> **...ash will be transferred from the thermal treatment unit to the land application area in the 15 cubic yard, roll-off bins. Bulk handling of this now contamination-free ash is simpler and more cost effective.**

Bulk handling may be possible, although onsite incinerator operations at other sites have containerized the ash as it was conveyed from the incinerator. Issues regarding the handling of the ash would be considered during the design phase for the project.

> **...redundant power supplies are not necessary. Safety is ensured without a redundant power supply by implementing a process whereby soil feeding mechanisms are interlocked to stop feeding soil on flame-out in either combustion chamber. If there is a power failure, the soil feeding equipment ceases operation. The heat stored in the refractories of the combustion chambers is adequate to keep the gas temperatures sufficiently high to destroy the vaporized TCDD within the unit.**

Redundant power supplies would be used as required to ensure that the incinerator could be safely operated and risks minimized. Issues regarding the use of power supplies would be evaluated further during the predesign and design phases of the project.

> **The need for upgrading of roads, pilot cars and other costly measures to transport the bagged soil from these sites is not justified by the scale or risk associated with each transport project.**

Road upgrading and other transportation control measures would be used as required to ensure that the soil could be safely transported.

Section 7--Noncost Analysis of Alternatives

> **...the last paragraph on the page states that "...the no-action alternative would provide no access restrictions...", this is inconsistent with descriptions of the No Action Alternative in Sections 4 and 5. ...the No Action Alternative would be a viable alternative if appropriate site security measures were implemented.**

By definition, the no action alternative would not include access restrictions. Such measures would, however, be required to control potential exposure if no further measures were implemented.

> **...the installation of ring levees or other flood control measures is not justified by the site characteristics, and this work should be halted immediately.**

The Times Beach site has encountered repeated flooding. This is a characteristic of the site. The use of flood control measures are clearly needed to reduce the effects of such occurrences. The spur levees are being constructed to reduce water velocity during flood events to minimize scour and erosion. The Ring Levee is required to flood protect the thermal treatment unit during implementation.

> **...the reliability of enhanced vegetation and sediment barriers is very high for a contaminant such as TCDD.**

As noted in the feasibility study, reliability includes operation and maintenance requirements and demonstrated and expected reliability. Periodic operation and maintenance would be required to maintain the effectiveness of enhanced vegetation and sediment barriers.

> **While some limited confirmatory monitoring may be desirable, it is certainly not necessary, in light of what is known about the characteristics of TCDD and of the Times Beach site.**

A monitoring plan will be developed during the design phase of the project.

> **The minimal concerns of maintaining grass cover [for in-place containment], etc. are insignificant and no more difficult than growing grass in a residential yard. Inspection of the site in its current state indicates that there will be little difficulty in providing a substantial vegetative**

cover.

The difficulties of maintaining grass cover would certainly be more difficult than growing grass in a residential yard. The substantial area involved, the lack of continual care as would be typical for a residential area, the potential for flooding, the presence of TCDD below the cover and need to prevent exposure to the material, and the contour of the soil cover would all contribute to making maintenance more difficult than for a typical residential yard.

> **The concern expressed by EPA that transportation of large quantities of offsite borrow to Times Beach poses a risk of automobile accidents during implementation of Alternative 3 is groundless. There is a borrow site on the south side of interstate highway Interstate 44 sufficiently large for this project which will not impact local traffic flow.**

The specific location where borrow would be obtained has not been determined. If the location on the south side of Interstate 44 were used, traffic difficulties would be minimized.

> **...there is no need for leachate collection or treatment if leachate is not generated.**

Leachate would almost certainly be generated during the period when the land disposal facility was being filled and a cover constructed.

> **Constructability of a suitable monofill in the Times Beach floodplain is not a major problem. Placement of a protective cover can proceed concurrently with placement of the contaminated fill material.**

Construction of a land disposal facility in a flood plain would require the use of many specially engineered features not required for a similar facility not constructed in a flood plain. Some work on the cover of such a facility may be performed during filling operations for the facility.

> **The use of the term "leaching" with respect to sediment is improper. Leaching generally refers to the mobilization and transport of contaminants in solution.**

As used in the feasibility study, leaching refers to the movement of water through stored TCDD-contaminated soil. The use of this term is consistent with accepted use of the word, which means to cause a liquid to filter down through some material.

> **A monofill, minus the necessary liners, leachate collection, and leak detection systems, would provide no potential for erosion of TCDD contaminated sediment other than from the surface.**

Erosion of material is typically a surface phenomenon, thus if erosion were to occur from any contaminant facility, it would likely occur at the exposed surface. The fact that surface erosion could occur from a monofill affects the suitability of such a method for disposal of dioxin-contaminated soil.

> **Traffic accidents are a risk associated with all of the Alternatives, as well as any heavy construction project. These risks are minimized by proper construction management.**

It should be noted that alternatives that require more transport than others have a higher risk of accidents. Precautions will be taken to minimize the potential for accidents.

> **EPA indicates that some minimal risks of exposure would remain from potential leaching of TCDD from the disposal facility. This conclusion is much more relevant to a commercial facility than it is to onsite land disposal at Times Beach.**

This is consistent with the feasibility study.

> **...onsite land disposal is a much more environmentally sound solution than offsite land disposal at a commercial facility.**

Offsite land disposal would present some environmental risk due to the transport of contaminated soil, and increased potential for leachate generation.

> **The fact that no landfill disposal facilities have obtained the necessary permits to store TCDD-contaminated material, and apparently have shown little interest in accepting dioxin contaminated material, confirms the obvious infeasibility of this Alternative.**

There are implementability issues involved with the offsite land disposal alternative.

> **The reliability of the incinerator is a function of proper design and proper project management.**

Proper design, construction, and operation should assure the reliability of the thermal treatment unit.

> **...constructability of the incinerator facility in the floodplain at Times Beach, presents no major problem.**

A thermal treatment facility could be designed and constructed for use in the Times Beach floodplain. Such a facility would include specially engineered features to minimize the effects of a flood if it were to occur.

> **The commentor states that the use of delistable residues as backfill in excavated areas should be integral to the incineration project.**

This option should be considered during design. Residues must be disposed of in accordance with federal and state laws, regulations, and standards that are determined to be applicable or relevant and appropriate.

> **...the problems cited at the Denney Farm mobile incinerator relate to a small, experimental, direct-fired incinerator. An indirect-fired rotary kiln, specifically designed to process large quantities of Times Beach soils, would not be expected to experience these problems.**

Many of the operational problems encountered at Denney Farm were solved during the operations there. Although an indirect-fired kiln may indeed not experience the same types of problems, it is expected that the experience gained at Denney Farm should help prevent similar problems for the many types of thermal treatment equipment that could be used at Times Beach.

> **EPA notes that transportation of materials to and from the site could be difficult in the winter due to adverse driving conditions. ...dealing with such problems represents another routine element of proper project management. Similarly, proper project management ensures that a competent staff will be maintained for the duration of the project.**

These are among the important issues that must be considered during the design and selection process for a thermal treatment project.

> **...this alternative (offsite treatment) is not practical due to the excessive costs associated with land acquisition and material transportation.**

Costs for land acquisition and transportation are important factors for this alternative which will be considered in making the final selection of the remedy.

> **...it is highly unlikely that any remedial action at Times Beach would have any effect on the concentration of dioxin in the Meramec River. In addition, the concept of a "discharge" into drainage ditches used in the feasibility study is foreign to the Clean Water Act. For these reasons, among others, use of water quality criteria as a "relevant and appropriate" requirement for various Times Beach alternatives considered is not justified.**

There does exist a small potential for further contaminating the Meramec. Contamination can be avoided by use of proper techniques during the remedial actions. Lack of proper care could result in discharge to the river.

In discussing the water quality criteria in the feasibility study, it was not EPA's intention to imply that a discharge regulated under the Clean Water Act would definitely be involved in implementing the alternatives examined. Rather, it was the Agency's purpose to examine regulations which address dioxin contamination and to explore their applicability to the situation at Times Beach and to the remedial alternatives considered in the Feasibility Study.

> **...it appears to have excluded from consideration a limited action "capping" alternative that attains or exceeds any arguably relevant and appropriate RCRA closure requirements. ...EPA's choice of materials for its proposed cap caused its limited action alternative to fail to meet the RCRA requirements.**

The alternatives examined are intended only to present a range of alternatives and costs. Alternatives not specifically described in the Feasibility Study (including use of an impermeable cap) are not eliminated from consideration or selection. The NCP decision process allows selection of remedies which differ in detail from those in the Feasibility Study. Thus, alternatives utilizing an impermeable cap have not been eliminated from the range of alternatives being considered by EPA. Placement of a cap meeting RCRA requirements was evaluated in the Proposed Plan.

> **EPA also fails to explain why it did not rule out the more costly incineration and offsite disposal alternatives under 40 CFR. 300.68(g)(3), which states, "If an alternative has significant adverse effects, and very limited environmental benefits,**

> **it shall also be excluded from further consideration."**

Incineration and offsite disposal do not have significant adverse effects. The potential for adverse effects from both alternatives can be addressed with proper engineering and procedures. The benefits of permanently removing the dioxin from the environment must be considered in evaluating the incineration alternative.

> **EPA correctly notes...that ARARs need not be attained "under one of six exemptions." ...the feasibility study states, "No attempt is made to determine which, if any, of the requirements might fit one or more of the exceptions in the NCP or SARA. That is a decision that must be made by EPA and published as a finding of the Administrator, presumably after public comment." EPA, however, implies that further opportunity for public comment may not occur...**

The feasibility study was prepared by an EPA contractor. It is an engineering study prepared for EPA and avoids making Agency decisions. Opportunity for further public comment was provided in response to the Proposed Plan, which discussed potential waivers from ARARs.

> **The feasibility study is deficient in failing to set forth "findings, together with an explanation and appropriate documentation" for the exercise (or non-exercise) of each of these waivers.**

The language of SARA is very clear in requiring the President to publish findings, etc., in cases in which he decides to exercise one or more the six exemptions. At the time of the publication of the Feasibility Study, no decision had been made by EPA regarding the applicability of potential waivers from ARARs. Thus, no "findings," "explanations," or "documentation" were required.

> **...there is no law, regulation, policy or standard under either Federal or State law which purports to establish this 1 ppb level of concern criterion for TCDD.**

The wording of SARA refers to "any standard, requirement, criteria, or limitation...," not "law, regulation, policy, or standard." EPA believes the 1-ppb standard for residential soil can be appropriately considered to fall into one or more of the categories mentioned by SARA. In cases where laws, regulations, and standards do not exist, the EPA can rely upon recommendations from federal and state health agencies to determine appropriate levels of concern for protection of public health and the environment.

> **...the Superfund Guideline states that a 10^{-4} to 10^{-7} risk may be used. More importantly, the Guidelines recommend incorporation of site specific factors.**

These guidelines may be used for consideration of health risks posed by the site.

> **The feasibility study assumes that onsite cleanups require permits. The study also assumes that the absence of permitting requirements for a technology preclude the use of that technology in an onsite CERCLA action. These statements are wrong.**

SARA clearly eliminates the requirement for permits for those portions of a remedial action that occur entirely onsite. Further, the discussion of the absence of permitting requirements for certain technologies does not imply that this use at Times Beach is precluded. A new offsite unit could be permitted for use in the Times Beach remediation if appropriate permitting regulations were developed or identified.

> **The feasibility study also fails to consider CERCLA's express preference for alternative treatment technologies,... The failure by the feasibility study to adequately consider alternative thermal treatment technologies, particularly indirect fired thermal treatment technologies...and the "permit" assumption cause the feasibility study to overstate the costs of permanently destroying TCDD in soils at Times Beach.**

SARA clearly states a preference for permanent remedies and expressly allows for use of technologies that have not been utilized at similar sites. Nothing in the Feasibility Study eliminates indirect-fired thermal treatment from specific consideration for the project, if advantages exist that warrant its use.

> **It is unlikely that a Times Beach guard hired to patrol a so-called hazardous area would accidentally ingest significant quantities of dirt by smoking or eating while driving in a police car through the site during perhaps 2 hr of every 8 hr day. Further, there is no reason to believe that the airborne levels of dust to which he or she is**

> **exposed are any greater than the ambient dust levels for that area...**

As noted in the feasibility study, a conservative approach was used to estimate risks posed by the site. This approach is compatible with the requirements of the Superfund Public Health Evaluation Manual.

> **It is not enough to say that since exposure is reduced, so must be the risk. Alternatives II, III, IV, V and VI do not clearly quantitate how the level of risk will be reduced if and when these alternatives are adopted.**

EPA believes that the selected alternative must meet cleanup levels established by EPA on the basis of the recommendations of appropriate governmental health agencies for protection of public health and the environment.

Section 8--Cost Analysis of Alternatives

> **...more accurate cost estimates than the "Order of Magnitude Estimates" can be made. Not only can the estimates be more accurate but they will be drastically reduced from the elevated forecasts which have been presented in the feasibility study. There is no reason to believe that an order of magnitude estimation procedure is necessary or appropriate for this feasibility study. Instead, a cost estimate with no more than 10-20% leeway would be considered more appropriate... ...the current site information available is more than adequate to re-estimate the remedial costs with a better accuracy than +50%/-30%.**

As defined by the American Association of Cost Engineers, an order-of-magnitude cost estimate is an estimate produced without detailed engineering data. More accurate estimates (budgetary or design estimates) require the use of layouts, flow diagrams, etc., of the actual process to be installed. This type of information is clearly not available at the Feasibility Study stage. EPA guidance recognizes that study-level estimates will have an accuracy of +50 percent to -30 percent and that more accurate estimates are not necessary at the study stage.

> **Scope contingencies of between 15% and 25% are used in the feasibility study. If changes of scope of this magnitude are allowed, a total re-evaluation and subsequent reestimation is in order.**

The use of scope and bid contingencies are an accepted part of cost estimating. It is expected that there will be deviations from the assumptions noted and that contingencies are needed for accounting for those unforeseen items.

> **... mobilization and demobilization capital costs are calculated at 8% of the estimated capital costs....further incinerator demobilization costs of $250,000 are listed. It seems that the demobilization costs are overstated in these alternatives by at least $250,000.**

The 8-percent demobilization charge is based on installed capital, which does not include the incinerator. The amortized cost of the incinerator is included in the operating cost for the incinerator. Thus, a separate mobilization and demobilization charge must be added for the incinerators.

> **...the expected depth of excavation averages 2.18 feet. At that depth, it is expected that the concentrations of TCDD contamination will be 1 ppb or less.**
> **Independent calculations indicate that the excavation area is only 181,300 square yards which converts to 60,400 cubic yards at an average depth of excavation of 1 foot. ...if EPA should nevertheless determine to undertake excavation, then excavation should only extend to a 1 foot maximum depth and then be backfilled with clean soil.**

Excavation will be undertaken to a level determined by the Agency based upon recommendations of federal and state health agencies to represent an acceptable risk. For evaluation purposes, it is assumed in the feasibility study that the excavation to a depth of 2 feet is necessary to achieve a 1 ppb residual level, although the actual depth will vary according to the contamination that is detected.

> **Cotton coveralls, work gloves, disposable dust masks, and good hygiene more than adequately protect personnel performing soil handling activities.**

The level of protection described in the feasibility study is similar to that used for removal activities at other Missouri dioxin sites and during work at the Denney Farm incinerator trials. This level of protection is recommended by appropriate health agencies to adequately protect personnel.

> **...level D protective equipment is specified for equipment operators in totally enclosed cabs.**
> **...no protection is required if the cab has been**

> **fitted with the proper filtration system for its air conditioning/heating controls.**

Since it may be necessary for personnel operating equipment to leave their equipment or communicate with personnel in the contaminated zone, Level D protective equipment is considered to be necessary. This level of protection consists of coveralls and steel-toed work boots, which is considered to be a reasonable level of protection of the equipment operators.

> **Dual responsibilities of remedial personnel address the areas of decontamination personnel and onsite safety officers. An onsite, registered nurse is not merited by the minimal risks of these activities....remedial activities have successfully proceeded without this service.**

Onsite nurses have been used during onsite excavation activities to closely monitor personnel involved in hand labor and wearing protective gear. Nurses will be used as required to protect workers. Dual responsibilities will also be used where such use is considered appropriate.

> **Additional sampling prior to the initiation of remedial activities at Times Beach is unnecessary.**

EPA believes that the data available at the time of publication of the Times Beach Feasibility Study is insufficient upon which to design a remedial action. Additional sampling will be required to determine the extent of contamination prior to implementation.

Criteria should be established to determine when dust control would be necessary. Unless needed, the use of water spray should be discouraged, since it dramatically increases the labor intensive nature of the clean-up as well as the ultimate cost of incinerating this wet soil.

Limited use of water spray as a dust control measure is unlikely to "dramatically increase" the labor intensive nature of the cleanup. Dust control will be used as required to prevent generation of undesirable quantities of fugitive dust during excavation and handling operations, and to ensure the safety of site workers and local community.

> **...guards will not be required after the fence installation....the first construction activity for these Alternatives should be the installation of the fence, then the guards would only be needed for the first six months maximum...**

Guards would be used not only to prevent intruders from contacting contaminated soil, but also to prevent vandalism of equipment used at the site.

> **...automatic sampling systems are specified for installation in several drainage ditches....two, and at most three, drainage ditches should be chosen for monitoring surface run-off.**

The precise number of sampling monitors and their locations would be determined during predesign, design, and the initial phases of a sampling program.

> **perimeter air monitoring is specified. Previous air monitoring samples have shown no detectable levels of TCDD migrating offsite. With no change in the status of the site, additional air monitoring is an unnecessary expense...**

Continuous onsite and offsite ambient air monitoring would be provided to assure the safety of onsite workers and the local community.

> **...Level C protective gear is specified for excavation and Level D protective gear is specified for construction workers building the concrete facility. Such protective equipment is unnecessary since the construction is proposed within an uncontaminated area. Typical construction clothing is adequate...**

The level of protection described in the feasibility study is similar to that used during removal operations at other Missouri dioxin sites based upon recommendations of federal and state health agencies. Level D protection consists of coveralls and work boots, which is typical for construction sites.

> **...the size of the water treatment system for Alternative 4 is to be capable of treating a 24 hour, 25 year storm. In addition, a 20% capacity allowance is added. This capacity is excessive because:**
>
> **1. Leachate can be safely stored in the concrete facility...**
>
> **2. Excavation will not proceed during the storm event and for several days thereafter...**
>
> **3. Water in excavated areas should not be**

considered contaminated...

The size of the leachate treatment systems must be sufficient to protect the land disposal facility. The treatment system must prevent water from accumulating to the point where the liners or underdrain system could be damaged. The primary consideration in the sizing of the system would be the prevention of unacceptable quantities of rainfall build-up in the storage facility. This will be particularly critical during excavation operations when the facility would be open and rainfall could not be prevented from entering the facility.

> **...operating costs can be accurately calculated (within 20% or less) for a given set of assumptions. If the assumptions change (most importantly soil volumes or moisture content), then the estimates must be recalculated.**

The accuracy of the cost estimates presented in the feasibility study is typical of that required for feasibility studies. The accuracy is considered to be suitable for decisionmaking. It is expected that actual site remedial alternatives will vary somewhat from those described in the feasibility study. More accurate estimates will be produced during the predesign and design of the selected remedial alternative.

> **To make the following statement (Page 8-8, feasibility study): "It is doubtful that present or future costs to operate an onsite incinerator for destroying TCDD from contaminated soil can be estimated accurately.", conveys the incorrect impression that incineration techniques and processes are not well-defined.**

Incineration techniques and processes are reasonably well-defined, but, as the options described by the commentor show, many variations are possible. In addition, there are a large number of items that would influence the prices offered by an incineration service company, beyond the techniques and processes. At the feasibility study level, it is not possible to forecast precisely the prices charged and approach that will be taken by all the companies that might offer their services on such a project.

> **...the $400/cubic yard assumed unit cost for incineration is excessive and the cost estimates in the feasibility study should be modified to reflect this information.**

The basis for the $400/cubic yard cost estimate is included with the detailed costs presented in the feasibility study. This cost, which is considered to present the full scope of costs likely to be encountered by an onsite incineration services company, is considered to be a reasonable estimate of the changes required based on the assumptions noted in the text.

> **...a level area of 28 acres is required for the incinerator facility. In the Norris Report an area of only 3.5 acres was specified. Also in the Norris Report, the entire 3.5 acres was proposed to be raised above the 100 year flood plain with offsite borrow for an estimated cost of $575,000.**

In the feasibility study the ring levee and other necessary site preparation projects are estimated to cost approximately $4,000,000 after bid and scope contingencies are included.

The precise area required for an incineration facility will depend strongly on the requirements for storage of excavated material and ash, as well as the requirements for the incinerator and access and support facilities. These requirements will be examined in greater detail during the design phase for the project. It is doubtful that the entire facilities, including incinerators and adequate supply of feed material and flood protection, can be located within a 3.5-acre area.

> **...diked tank areas (are noted) for scrubber water and caustic storage tanks. With a dry pollution control system installed downstream of the secondary combustion chamber...instead of the wet scrubbing system specified in the feasibility study, the $1,500,000 in the feasibility study estimates can be eliminated.**

The specific air pollution control system to be used would depend on the systems proposed by service companies submitting proposals on the project. A wet system is assumed, but not "specified" by the feasibility study. A dry scrubbing system may be proposed, although such a system is presently generally not used by incineration service companies. Even with such a system, a quenching operation would be required to reduce the temperature of gases going to the dry equipment. Such a system would require the use of caustic.

> **...the feed storage (or contaminated soil storage) facility for the incinerator system. A better system is described in the Norris Report which provides more storage at reduced costs.**

Alternate methods for storage of material would be considered during the predesign and design phases of the project. It is noted in the feasibility study that systems that differ from those described conceptually in the report may be used.

> **Cooling water will be needed for the waste heat boiler but not at the overall water supply rates noted in the feasibility study.**

Cooling water rates may vary from those described in the report. The rates described in the feasibility study are based on information from incineration service companies that are actually involved in site remediation using incineration.

> **Operators of the incinerator should only be required to observed good hygiene practices since a totally enclosed incinerator system can be specified. Operators feeding soil into the grinding and feed section of the incinerator may require disposable dust masks and cotton coveralls in addition to practicing good hygiene.**

The level of protection described in the feasibility study is similar to that used during the Missouri dioxin removal and incineration activities at the Denney Farm site. The level of protection required for the incineration operator will depend, in part, on the system offered by companies proposing to perform site incineration services.

> **Operating efficiencies of 70.8% were assumed. This would not be acceptable in an industrial setting where an 80%-85% operating efficiencies or higher are typical.**

Operating efficiencies were assumed to be typical of those encountered after extended operation at sites where onsite incineration has been performed. The setting assumed for site remediation is clearly not an industrial setting.

> **...the capacity of each unit will be 4.25 cubic yards per hour....this capacity is limited by the "mobile" restrictions in early comments. This Capacity could be increased to 5.56 cubic yards per hour (+30%) with a transportable, modular unit.**

The operating rate used in the feasibility study is based on the typical size of mobile or transportable incinerators currently in operation for onsite hazardous waste remediation. It is possible that a larger incinerator could be constructed and offered by an incineration service company.

> **...it is customary to work from March through November which adds at least two months to the excavation season. Also, between December and**

> **February, days will be available which allow excavation and backfill to proceed. The estimated project life could be shortened by over 8 months with these considerations and soil storage facilities, ring levee, and overall site area for the incinerator can be reduced in size by 8 times over the 28 acres proposed in the feasibility study.**

A number of expenses will be incurred while holding an excavation team on standby during the periods when excavation cannot be performed. Since the actual project life is determined primarily by the operating rate of the incinerator, the project life would not be significantly affected by a different excavation schedule. Factors such as these would be evaluated during predesign and design of the selected alternative.

> **The material which has already been placed in bags will create significant and costly handling difficulties in their removal from their storage barns, moving them to any incinerator, and handling them at any incinerator. The bags will also require another disposal alternative since they cannot be easily incinerated.**

Handling of the existing material will not present undue handling difficulties. These containers can be handled with conventional handling equipment, as they have in the past. It has been demonstrated at the Denney Farm site that these containers can be incinerated.

SECTION 3

FEASIBILITY STUDY OF FINAL REMEDIAL ACTIONS FOR THE MINKER/STOUT/ROMAINE CREEK SITE

INTRODUCTION

In July, 1986, the U.S. Environmental Protection Agency released a study entitled Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site for public review. This study evaluated remedial alternatives for final management of dioxin-contaminated soil at all portions of the Minker/Stout/Romaine Creek site, including the Sullins and Cashel properties. A public comment period was held from August 8, 1986 through September 5, 1986, and included a public meeting conducted August 25, 1986 to discuss the study.

This responsiveness summary presents the Agency's response to public comments received by the Office of Public Affairs, Environmental Protection Agency, Region VII, Kansas City, Kansas, concerning the Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site. This responsiveness summary constitutes a component of the record of decision which documents the remedial action selection.

This Responsiveness Summary documents for the public record:

Concerns and issues raised during the August 25, 1985 public meeting concerning the Minker/Stout/Romaine Creek site.

Written comments received during the public comment period for the Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site.

How EPA has considered and responded to these comments in selecting a final management alternative for the dioxin-contaminated material at the site.

The comments are grouped into several categories, according to the topic that they address. The topics include comments received during the public meeting, procedural comments, comments regarding the schedule for the decision-making process, comments regarding the tentatively selected alternative or alternatives not selected, and technical questions and comments. This responsiveness summary is organized according to these categories.

COMMENTS RECEIVED DURING THE PUBLIC MEETING

At the public meeting, there were several questions regarding the cleanup and the proposed alternative.

EPA was asked if the incinerator currently in southwest Missouri would be used to thermally treat the soil from the Minker/Stout/Romaine Creek (M/S/RC) site.

The EPA mobile incinerator in southwest Missouri is a research unit. This incinerator has been issued a research permit for treatment of specific material, which does not include dioxin-contaminated soil from the M/S/RC site. Therefore, the EPA mobile incinerator is not currently available for the treatment of this material.

The unit in southwest Missouri will not be considered for treatment of material from the M/S/RC site due to its limited capacity which would result in an excessive cost and period of time required to treat all of the material from the site.

EPA was asked why they were proposing offsite thermal treatment when no such capacity currently exists.

With the exception of the EPA mobile incinerator located in southwest Missouri, no thermal treatment unit has been issued a permit by EPA to treat dioxin wastes. Although there are currently no permitted thermal treatment units available for treatment of the contaminated soil from the M/S/RC site, several companies have such equipment or the capability of constructing such a device. Several firms operate transportable thermal treatment units which can be assembled at an offsite location and designed to handle the soil and other contaminated materials from the M/S/RC site. EPA anticipates that a number of qualified bidders will respond to a request for proposals (RFP) for offsite thermal treatment of the dioxin-contaminated material from this site.

A question was asked regarding the availability of funding to carry out the cleanup.

The proposed remedy would be carried out using funds generated by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). This Act establishes a trust fund to finance response actions at uncontrolled or abandoned hazardous waste sites (Superfund). Sufficient funds are available in this fund to implement the proposed remedy.

Ninety percent of the cost of the project would be funded by Superfund. The State would be required to provide a 10 percent cost share for the project. The State has indicated their ability to generate the necessary funds, should this remedy be selected.

> **EPA was asked how much the offsite thermal treatment alternative will cost.**

The Feasibility Study of Final Remedial Actions at the Minker/Stout/Romaine Creek Site includes what is referred to as an order of magnitude cost estimate. Such estimates are expected to be accurate to within +50 percent and -30 percent. The cost estimate presented in the feasibility study for offsite incineration of 20,000 cubic yards of contaminated soil is $25,000,000. Thus, the actual cost is expected to fall between $17,500,000 and $37,500,000. Uncertainties involved in making the estimate result in the range of values.

Since the feasibility study was released in 1986, the Agency has gained information which enables a more accurate cost estimate to be prepared. The best information available to the Agency indicates that the unit cost for operation of a thermal treatment unit is expected to be approximately $400 per cubic yard, as compared to $700 per cubic yard presented in the 1986 feasibility study. The total volume of soil to be treated from the M/S/RC site is currently estimated at 12,000 cubic yards, compared to the feasibility study estimate of 20,000 cubic yards. This results in a reduction of the estimated cost of offsite thermal treatment for the material from the M/S/RC site to approximately $15 million.

Once the remedy is selected, a detailed design of the alternative will be developed. At that time, it will be possible to prepare a much more precise estimate of the final cost.

> **One commentor noted that a previous proposal to locate a central facility at Times Beach had not been received favorably. EPA was asked if similar opposition was expected for the proposal to locate a thermal treatment unit at Times Beach.**

In 1984, a Record of Decision was signed for construction of an Interim Central Storage Facility (ICSF) at Times Beach. This unit was designed to store dioxin-contaminated soils from the nearby Castlewood, Quail Run, and Minker/Stout/Romaine Creek sites. The project did not involve management of contaminated soil or structures and debris from Times Beach.

A primary reason that the public was opposed to this project at that time was because no final management capacity for the stored soils was identified. Nearby residents were concerned that the soil would remain in storage for an indefinite period of time in the absence of such a final management alternative. The surrounding community expressed opposition to the permanent management of hazardous materials at Times Beach. In addition, the proposed ICSF did not address contaminated soils or the deteriorating structures and debris at Times Beach. Management of offsite soils did not benefit the nearby community. EPA believes that a thermal treatment unit will be received more favorably than the previous proposal to build a storage facility at Times Beach. Thermal treatment at Times Beach would represent a final remedy for contaminated soils located at both M/S/RC and Times Beach, rather than an interim step involving the potential long-term management of hazardous materials. Once the dioxin is destroyed by thermal treatment and delisted, the soil would no longer be hazardous, and the threat to public health and the environment would be eliminated. Following thermal treatment, the unit would be dismantled and removed, leaving Times Beach free of any hazardous waste management activity.

The proposed remedy at Times Beach also involves final management of the deteriorating structures and debris at Times Beach, which has been another primary concern of the nearby community.

The south outer road to Interstate 44, which provides alternate access to the adjacent city of Eureka, has been closed since implementation of the permanent relocation in 1983. This has resulted in an increase in traffic congestion at the Eureka interchange. Following completion of the proposed remedial action at Times Beach, reopening of the south outer road would be possible. This action is strongly supported by the residents of Eureka.

> **EPA was asked whether or not other sites, besides Times Beach, are being considered for thermal treatment of contaminated materials from the M/S/RC site.**

Times Beach is the only location which has been identified by the state and EPA that is suitable for implementation of the proposed remedy. No other sites are actively being reviewed at this time. EPA and the state will evaluate other feasible sites to locate the unit, if recommended.

> **The state was asked whether or not the property deeds of the houses at the M/S/RC site would always include a notation that the property had once been contaminated.**

Deed restrictions are implemented by the state. State law requires that the notation always remain on the property records. However, once the property is cleaned up, and the Department of Health certifies the cleanup, the property records are updated to indicate that the property is once again safe for habitation and unrestricted use.

> **EPA was asked why the option of a buyout was not addressed in the feasibility study.**

The issue of public health risk and the need for permanent relocation was addressed in 1983 immediately following the discovery of dioxin contamination at the site. Those residents determined to be at risk have been provided either temporary or permanent relocation, as appropriate.

> **A question was asked regarding the schedule for removing the contaminated soil currently in temporary storage at the Minker area.**

The Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site includes a schedule for the preferred alternative which indicates that the entire operation should require less than 5 years from project initiation, with all of the soil removed from the site in slightly more than 4 years. If the proposed remedy is selected in a Record of Decision, EPA is confident that this schedule is reasonable and can be met.

> **EPA was asked whether a mitigation plan was prepared for the work that was underway a few days preceding the August 25, 1986 public meeting.**

A mitigation plan was prepared for the removal action which commenced at the Abrahamson and Payne properties prior to the meeting. As explained at the public meeting, this mitigation plan was available prior to and during the removal action at the EPA Public Information Center located at the Minker portion of the site.

> **EPA was asked whether or not it had actually been demonstrated that the soil from the site could be incinerated and also if incineration would be feasible for asphalt and concrete.**

The incineration demonstration that EPA has carried out in southwest Missouri has successfully demonstrated that thermal treatment is capable of destroying dioxin in soil to undetectable levels. No dioxin contamination has been detected in the residue (ash) or any emissions from the unit. The destruction and removal efficiency is high enough to meet permit requirements under the Resource Conservation and Recovery Act, as amended (RCRA). Residue from the process has been successfully delisted and disposed of as a solid waste. Thus, EPA has demonstrated that the dioxin contamination in Missouri soils can be safely destroyed by incineration.

The incinerator in southwest Missouri is capable of processing concrete and asphalt. The thermal treatment unit that is proposed to treat the soil from the M/S/RC site will also be able to process asphalt and concrete. However, steam cleaning has been demonstrated to be an effective means of decontaminating concrete, and is likely to be more cost-effective than thermal treatment.

A question was asked regarding the amount of time that the EPA incinerator has been out of service during the demonstration in southwest Missouri.

The EPA incinerator is a research unit, originally intended for handling liquids, and not designed to handle large volumes of soil efficiently. EPA experienced some initial difficulties in the operation of the incinerator, resulting in considerable down-time for maintenance. However, as noted in the previous response, the incinerator was successful at destroying dioxin in soils to undetectable levels.

The EPA mobile incinerator has been retrofitted with better materials handling equipment, which has enabled processing several times the amount of soil per hour that it was initially capable of, and has significantly reduced the amount of down-time required for maintenance.

A question was asked about the capacity of the EPA mobile incinerator.

As noted in a previous response, the capacity of the mobile incinerator is limited by its original design and purpose. The new unit that would be built to treat the soil from the Minker/Stout/Romaine Creek site would be capable of handling larger volumes of soil than the incinerator EPA is currently operating.

A question was asked regarding the disposal of the residue from the thermal treatment process.

RCRA designates lists of specific hazardous wastes which are regulated by EPA under RCRA authority. Residue from the thermal treatment of dioxin-contaminated soil at the M/S/RC site is listed as a hazardous waste under RCRA, and subject to the requirements for the management of a hazardous waste. If it can be determined that the residue is free of the hazardous constituents or characteristics for which it was considered a hazardous waste, the residue can be disposed of as a non-hazardous solid waste. This determination is referred to as a delisting procedure. The residue from the EPA mobile incinerator has been demonstrated to meet delisting criteria and has been delisted as a hazardous waste. EPA believes that the residue from thermal treatment of the soil from the M/S/RC site can be delisted and disposed of as a solid waste.

The proposed method of disposal of residue from the thermal treatment unit is onsite disposal in a unit or units designed and constructed to meet solid waste management requirements. Another option would be to transport the ash to an offsite solid waste landfill for disposal. This option results in the use of valuable space in a sanitary landfill. The cost of transportation and the fee for disposal is likely to make offsite disposal less cost-effective. Therefore, onsite disposal of the residue is the preferred alternative.

A question was asked regarding the disposition of the houses that are currently unoccupied at the M/S/RC site.

The houses at the site have been restored, following removal and storage of contaminated soil, to a safe, habitable condition. The titles to the houses were transferred to the state following the permanent relocation. Following removal of the contaminated soil currently in storage from the site, the temporary storage structures will be dismantled and removed. The houses can then be sold, and revenue generated from the sale returned to Superfund for future cleanups at other sites. Sale of the homes has the advantage of returning the neighborhood to the level of housing density that existed before the contamination was discovered, and thus completes the restoration of the area to its original condition.

EPA was asked about the volume of soil to be removed from the Minker/Stout/Romaine Creek site.

Removal actions have been completed at the Sullins, Cashel, and Minker portions of the M/S/RC site. A total of 5,800 cubic yards of soil was excavated from these areas and placed in interim onsite storage at the Minker area. The two remaining portions of the site to be cleaned up include the Stout area and Romaine Creek. These cleanups are scheduled to be completed in the 1988 construction season. It is estimated that 1,900 cubic yards of soil will be removed at the Stout area, and 4,300 cubic yards of soil and sediment from Romaine Creek will be removed to meet cleanup criteria.

EPA believes that these soil volume projections are as accurate as possible prior to actually performing the soil removal. The lateral extent of contamination at the Stout area has been determined using a statistical sampling procedure which determines average dioxin concentrations to the 95 percentile upper confidence level. This sampling procedure is identical to the procedure which is used during the actual removal of contaminated soil.

The soil and sediment volume requiring removal from Romaine Creek is also known with a high degree of confidence. Dioxin contamination has been detected in the upper 6,000 feet of Romaine Creek. During preparation of the Romaine Creek Operable

Unit Feasibility Study stream sediment profiles were determined at intervals ranging from 100 to 300 feet in the upper 6000 feet of Romaine Creek. In a subsequent investigation, areas of sediment deposition were targeted for sediment depth measurements along the entire length of Romaine Creek. This information has enabled an accurate estimate of the contaminated soil and sediment volume to be prepared.

An estimated soil volume of 20,000 cubic yards was assumed in the feasibility study for the purpose of costing and comparing remedial alternatives. This estimate was prepared prior to the availability of statistical sampling data at the Stout area, sediment volume measurements at Romaine Creek, or completion of the removal action at the Minker area. The feasibility study evaluation process allows for a valid comparison of alternatives for a range of contaminated soil volumes. EPA believes that the volume of soil assumed in the feasibility study is a reasonably accurate volume upon which to base a remedy selection. In addition, the cost evaluation of the preferred alternative has been further developed in the Proposed Plan for Final Management of Dioxin-Contaminated Soil and Final Disposition of Structures and Debris at Times Beach, Missouri, and the Minker/Stout/Romaine Creek Site, Missouri (Proposed Plan). The actual cost of the remedy will depend on industry conditions when the contract is competitively awarded.

EPA was asked a question about the level of site restoration that is intended for the site. Specifically, whether or not everything would be restored to its original condition or, if necessary, replaced.

To the degree possible, everything at the site will be restored to its original condition following completion of response actions at the site. In cases where restoration to the original condition is not possible, or not cost-effective, items will be replaced with equivalent new items.

WRITTEN COMMENTS

PROCEDURAL

One commentor stated that EPA had not followed the requirements of the National Contingency Plan because it had not solicited or evaluated comments on the soil excavation and storage activities that have already been implemented.

The excavations at the Sullins, Cashel, Abrahamson, and Payne properties were carried out under EPA's "removal" authority under the National Contingency Plan. The National Contingency Plan does not require a public comment period prior to implementation of removal actions. Nevertheless, mitigation plans describing these removal actions were made available to the public prior to implementation. EPA has not failed to follow proper procedures in carrying out these removal activities. (The actions discussed in the feasibility study and Proposed Plan are to be carried out under the "remedial" authority. The National Contingency Plan does require a public comment period for remedial actions.)

> **One commentor stated that EPA has not met the National Contingency Plan requirement that remedial actions should be cost-effective because interim storage in the flexible containers is a more expensive approach than bulk handling. The commentor suggests that the soil should be left in place and excavated only when the thermal treatment unit is ready to receive it, and then that it be moved by bulk transport.**

EPA has considered allowing the contaminated soil to remain in place until final management capacity is available. Although it is initially more expensive to containerize the contaminated soil than to handle in bulk, EPA believes that the container storage option that it has been implementing is part of a cost-effective overall remedy which assures the short-term and long-term protection of public health and the environment.

If contaminated soil is allowed to remain in place, exposure to dioxin would continue to occur above a level of concern for protection of human health. Environmental exposure would also continue at an unacceptable level. Containment of the contaminated soil substantially reduces the potential for exposure, providing a high degree of short-term protection of public health and the environment. Soil containment also provides greater protection to workers during future soil-handling activities.

In addition to the continued exposure, the contaminated soil could continue to erode and migrate from the site. This results in the expansion of site boundaries and increases the amount of soil that will eventually have to be excavated, transported, and managed. These additional costs must be included in comparing immediate with delayed excavation. EPA has determined that excavating the soil now will reduce the total overall cost of the remedy.

> **One commentor stated that the No-Action alternative should have been given more consideration. The basis for this contention is that recent assessments of the risks presented by dioxin contamination do not support a need to clean up sites to the one part per billion level, and that**

> **it might therefore be reasonable for the contamination to remain in-place.**

As noted in a previous response, EPA believes that uncontrolled contamination at the M/S/RC site represents an unacceptable risk to public health and the environment. Removal actions involving the excavation and onsite interim storage of contaminated soil have been performed at the Sullins, Cashel, and Minker portions of the site. EPA determined, on the basis of advice from the Centers for Disease Control (CDC), that these actions were necessary to protect human health and the environment in residential settings such as the M/S/RC site. EPA has assessed the threat posed by dioxin contamination at the Stout and Romaine Creek portions of the site, and has determined that response is necessary to achieve protectiveness.

It should be pointed out that the no-action alternative in the feasibility study is not an alternative to leave the contaminated soil in place. The feasibility study is based on an assumption that the contaminated soil has, or will be, excavated and placed in interim storage. The no-action alternative in the feasibility study involves leaving the excavated soil in the temporary storage structures. The storage structures are not designed for permanent management of the contaminated soil. An unacceptable risk of future contaminant release would result if the temporary storage structures were used for permanent disposal. Therefore, the no-action alternative was found to be unacceptable.

SCHEDULE

> **One commentor stated that it would be inappropriate to develop and sign a Record of Decision for the Minker/Stout/Romaine Creek site until the location for the thermal treatment unit is established.**

In the Proposed Plan, EPA has identified Times Beach as the preferred location for the thermal treatment unit that would be used to treat dioxin-contaminated material from the M/S/RC site. If the preferred remedy is selected, the Record of Decision for M/S/RC and Times Beach will establish Times Beach as the location for offsite thermal treatment of contaminated soils at the M/S/RC site.

> **Three advantages of delaying a decision for final management of dioxin-contaminated material at the the M/S/RC site were suggested: (1) Delay would provide time for further development and analysis of chemical and biodegradation technologies as well as development and demonstration of additional thermal treatment**

> **technologies; (2) No adverse consequences would result from delay, since the storage buildings are designed to last for several years; and (3) More precise estimates of the costs of incineration will be possible.**

EPA has postponed a final management decision for more than five years, including approximately one and one-half years since public release of the Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site. During this time, EPA has studied the development of alternative technologies and has funded research efforts to analyze alternative technologies as a part of the National Dioxin Strategy and SITE (Superfund Innovative Technology Evaluation) program. To date, thermal treatment is the only alternative technology that has demonstrated, on a large scale, removal efficiencies for dioxin in soil which enable delisting and achieve protectiveness.

In the last few years, several thermal treatment technologies have been sufficiently developed that they could potentially be applied to the contaminated soils at the M/S/RC site. EPA believes that the competitive bidding process will allow the most cost-effective thermal treatment technology to be selected for the project. EPA does not believe that new thermal treatment technologies will be developed in the near future which will be more cost-effective than the technologies currently available. EPA has made a commitment to remove this soil as expeditiously as possible, within 10 years at the latest. Given the lead times required to establish and permit a treatment unit, EPA believes that it is necessary to make a decision at this time and to begin work on implementing the solution.

Information regarding the cost of thermal treatment has greatly improved since the release of the feasibility study due to experience with treatment of hazardous materials both within and outside the Agency. EPA believes that the technology has been developed and demonstrated to the degree necessary to prepare accurate cost projections. The actual cost to thermally treat the soil will be determined by industry and market conditions at the time that a contract is awarded for the work.

ALTERNATIVE SELECTED

Several comments either addressed the alternative EPA has tentatively selected or recommended that EPA consider or choose a different alternative.

> **Two comments supported the offsite thermal treatment alternative and the proposal of the state to locate a thermal treatment unit in Times Beach**

> **as a logical choice.**

As indicated in the Proposed Plan, EPA is proposing to use Times Beach as the site for a temporary thermal treatment unit.

> **One comment suggested that EPA let the sun destroy the dioxin. The suggestion is based on evidence that dioxin on soil can be destroyed by the action of sunlight.**

EPA has evaluated the evidence that sunlight destroys dioxin on contaminated soil at sites in Missouri and finds that there is much stronger evidence that the process of destruction, if it occurs at all, is too slow and much too inefficient to take advantage of in cleaning up contaminated sites.

Some of the most compelling evidence comes from EPA's own sampling efforts in Missouri. At the Castlewood site as an example, there was contamination at very shallow depths, including contaminated dust on the surface of paved roads, that had not been destroyed by the sun over a period of several years. EPA sampled extensively along the roadways in the Castlewood area, and detected dioxin contamination up to 60 parts per billion at the surface. EPA believes this demonstrates that the action of sunlight is either insufficient or too slow to be utilized as an in-situ method to decontaminate sites.

EPA has responded to this suggestion at greater length in a letter to the person making the comment at the public meeting.

> **One commentor stated that EPA should not eliminate the mine storage alternative only due to the lack of permitting standards for this type of a facility. The commentor recommended that EPA select mine storage as the remedy because thermal treatment would be more expensive, less protective of human health, and no more protective of the environment.**

As discussed in the feasibility study, thermal treatment of contaminated soils provides a higher degree of long-term protection of human health and the environment than mine disposal. Thermal treatment eliminates the potential for future exposure to the treated material. There is a risk of future release from any type of land disposal unit, including underground mines. Catastrophic failure of a mine used for storage of contaminated material could result in a tremendous additional cost to control potential release of contaminants into the environment.

There are short-term risks associated with thermal treatment including the potential for airborne release of products of incomplete combustion (PICs). These risks can be controlled by proper operating conditions, air pollution control equipment, and safety devices. There are short-term risks associated with both treatment and mine disposal during transport of contaminated material over public roadways and associated soil handling activities.

EPA is required to select the most cost-effective remedial alternative, not simply the lowest cost. The additional benefit that thermal treatment offers, i.e. permanent destruction of the contamination, justifies the additional expense. No other alternative offers this degree of short- and long-term protection of human health and the environment at a lower cost. Thermal treatment is therefore the most cost-effective alternative.

EPA is required to select a remedial alternative which attains all applicable or relevant and appropriate requirements for the protection of human health and the environment. The Resource Conservation and Recovery Act of 1976, as amended (RCRA) is applicable to the disposal of dioxin-contaminated soil from the M/S/RC site in underground mines. The implementing regulations of RCRA specifically state that dioxin waste can not be disposed of in underground mines prior to the development of appropriate regulations. An exemption from this regulation under SARA has not been identified. EPA therefore can not select disposal in underground mines for the dioxin-contaminated soil at the M/S/RC site.

> **One commentor suggested that EPA should develop an integrated solution for all of the dioxin sites in eastern Missouri. If analyzed in this way, a more efficient thermal treatment unit could be justified, which would substantially reduce overall costs.**

The Times Beach Feasibility Study evaluated locating a temporary thermal treatment unit at Times Beach that would be used to decontaminate the soil from Times Beach and three other identified sites, including Castlewood, Quail Run, and the M/S/RC site. The Proposed Plan has expanded this concept to include a total of 26 identified potential sites for centralized thermal treatment at Times Beach. A single centralized facility is more cost-effective than many individual onsite units since multiple one-time costs are eliminated (mobilization, demobilization, etc.), and economies of scale result from design of a larger unit capable of treating large quantities of soil more efficiently.

Technical

EPA received many comments that addressed technical issues or questions.

> **One comment suggested that EPA undertake a much larger sampling effort in order to establish the exact areal and vertical extent of the contamination. This, the commentor stated, would allow EPA to establish beforehand the depth to which each area of the site would be excavated and enable EPA to excavate the proper amount of soil in a single pass. The commentor suggested that this would be more efficient than the iterative excavation and sampling method EPA has been using because it would not involve long delays during excavation while waiting for results of the sampling.**

The Feasibility Study of Final Remedial Actions for the Minker/Stout/Romaine Creek Site does not address the procedure used for excavation of contaminated soil. The feasibility study assumes that the contaminated soil from the site has been previously excavated and placed in interim onsite storage. A discussion of the excavation procedure follows, although the comment is not included in the scope of this responsiveness summary.

The excavation procedure currently utilized by EPA during removal of contaminated soil is cost-effective and necessary to provide assurance that cleanup criteria are being achieved, while minimizing the amount of soil that is excavated. EPA Region VII has gained considerable experience with soil sampling during investigation of the Missouri dioxin sites. A number of studies have been performed to compare the reliability of various sampling techniques. EPA has determined that special sample collection procedures involving trenching and lateral sampling are required in order to obtain representative soil samples at depth below the surface for dioxin analysis in the parts per billion range. Trenching and lateral sampling are required due to contamination of the sample which occurs from more highly contaminated soil at shallower depths using conventional sampling procedures. Trenching and lateral sampling is very labor-intensive and costly relative to the collection of samples from the surface using conventional methods.

The sampling protocol which is currently utilized during the removal of dioxin-contaminated sites in Missouri was developed by EPA and other state and federal agencies involved, including the Centers for Disease Control, Missouri Department of Natural Resources, and Missouri Division of Health. The cleanup criteria established by these health agencies is based upon determination of dioxin concentrations using this procedure. This sampling protocol determines the average dioxin concentration within individual cleanup sections at a site to the 95% upper confidence level, and requires the collection of individual soil samples from at least 150 locations within each 5,000 square foot portion of a site. This sampling is performed prior to excavation and defines the areal extent of contamination.

In consideration of the number of samples that are required to determine if cleanup criteria are achieved, it is more cost-effective to determine dioxin concentrations at the surface, excavate, and resample, than to attempt to define the vertical extent of contamination prior to excavation using the labor-intensive trenching method. If a single-pass approach to excavation was employed, as suggested by the commentor, the same degree of verification sampling performed following excavation would still be required to determine if cleanup criteria are met. The only cost savings resulting from a single-pass approach would be a reduced likelihood that additional excavation would be required to meet cleanup criteria. This cost savings would be surpassed by the increased cost for the initial determination of the vertical extent of contamination.

The sampling and excavation procedure currently employed by EPA is designed to minimize the number of sampling/excavation iterations which are necessary to achieve cleanup criteria. This is done by recognizing the correlation between the initial surface concentration and the required depth of excavation. The initial depth of soil excavated in each cleanup section is adjusted according to the surface concentration determined prior to excavation.
In addition, the excavation crew is not delayed while awaiting sampling results. The site is divided into sections which are excavated and sampled independently. While waiting for analytical results from one section, excavation proceeds on other sections. Analytical results are available within 24 hours of submitting the samples to the laboratory.

> **A question was asked regarding the estimate of 20,000 cubic yards for the amount of soil to be excavated. The commentor was concerned that the figure might be much higher than necessary.**

As noted in response to a question at the public meeting, there is uncertainty in the volume of contaminated soil at a site until soil removal has been completed. The estimate of 20,000 cubic yards in the feasibility study represents an upper-bound estimate which was derived to make it possible to compare costs of alternatives. The estimate was sufficiently accurate, on the basis of the data available at the time of preparation of the feasibility study, to allow a valid comparison of alternatives. Since the completion of the feasibility study, the removal of soil at the Minker area has been completed, and additional sampling has been performed at the Romaine Creek and Stout portions of the site. The current estimate for the total volume of dioxin-contaminated material at all portions of the site is

12,000 cubic yards. EPA believes that the comparison of alternatives performed in the feasibility study is valid for this contaminated soil volume. EPA has updated the cost estimate for offsite thermal treatment in consideration of this revised soil volume estimate and other experience gained since preparation of the feasibility study. This evaluation is presented in the Proposed Plan.

> **One commentor agreed that thermal treatment represents a permanent and technically feasible alternative, but took exception to some assumptions in the study regarding the various incineration alternatives. Specifically, an offsite indirect-fired thermal treatment unit was recommended as more cost-effective due to the smaller gas handling equipment required and lower fuel consumption.**

The Proposed Plan identifies thermal treatment as a component of the preferred alternative. Thermal treatment represents a number of related technologies, including incineration. Rotary kiln incineration was assumed in the feasibility study for the purpose of evaluating costs, due to the amount of information regarding this particular technology which is available in the literature, and industry and agency experience with it use.

The type of thermal treatment to be implemented is not specified in the Proposed Plan, and will not be selected in the Record of Decision. EPA expects to advertise performance-based bid specifications to provide thermal treatment services for the contaminated materials. EPA will specify performance requirements which must be met by the thermal treatment unit. It will be the responsibility of each bidder to determine the particular type of thermal treatment technology to propose. If indirect-fired incineration offers a substantial cost savings over other types of thermal treatment, EPA would expect one or more bids to propose the use of such a unit.

It has been the Agency's experience that the cost of labor represents the primary cost of thermal treatment. Energy costs comprise a smaller portion of the total cost of operating an incinerator. If this holds true for other types of thermal treatment units, the energy cost savings of indirect-fired thermal treatment might not represent a significant fraction of the total costs.

> **One commentor questioned the appropriateness of the one part per billion cleanup level in consideration of recent improvements in the exposure and risk estimating methods used for assessing the potential health effects of dioxin. The commentor recommends that EPA reassess the exposure assumptions and health risk factors used in the previous risk**

assessments.

The cleanup level is not an issue in this feasibility study. This study and the decision process that EPA is initiating, assumes that the contaminated soil has been excavated and placed in storage. An explanation of the cleanup levels established for the site is provided, although this issue is not included in the scope of the feasibility study or this responsiveness summary.

As explained in the Proposed Plan, a paper was published in 1984 by Renate D. Kimbrough, M.D., et al., of the Center for Environmental Health, Centers for Disease Control, which evaluated acceptable concentrations of dioxin in soil for residential settings. A risk assessment was performed in this paper which concluded that dioxin concentrations exceeding 1 part per billion (ppb) in residential soils pose a level of concern for human health. This recommendation has formed the basis for the criterion of 1 ppb which has been applied during the cleanup of all residential sites in Missouri, to date, including the M/S/RC site. The Centers for Disease Control has recently affirmed that the risk assessment presented in the 1984 paper remains valid in consideration of all scientific evidence currently available.